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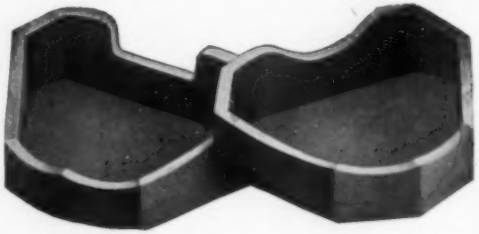

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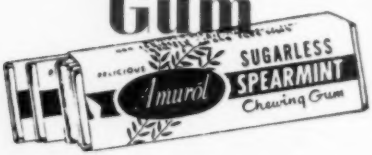

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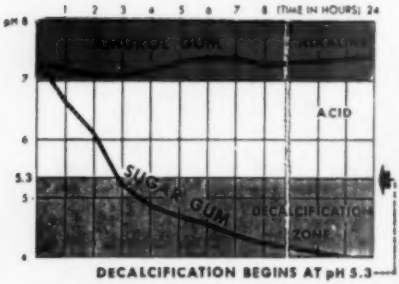

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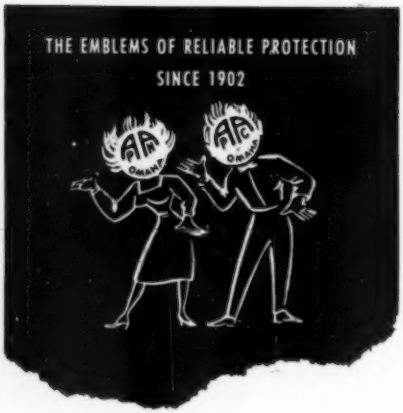

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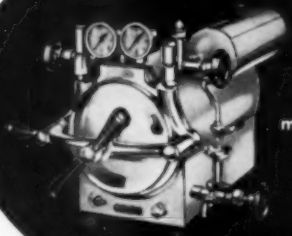

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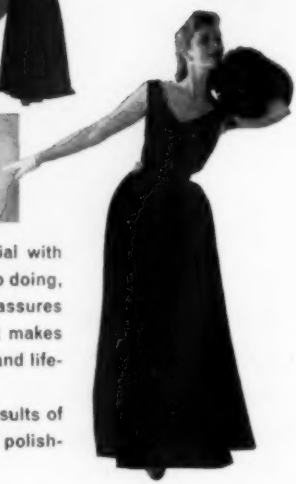

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Cinefluorography with image intensification for observing temporomandibular joint movements

Harrison M. Berry, Jr., D.D.S., M.Sc., Philadelphia, and F. Allan Hofmann,† Lancaster, Pa.*

This is a report on the production of roentgen motion pictures of the functioning temporomandibular articulation. The equipment utilizes the relatively new concept of image intensification, whereby the image recorded on the fluorescent screen is intensified 1,000 times in brightness by electronic means.

Prior to the development of image intensification, the motion picture camera recorded images directly from the fluorescent screen, a process known as direct cinefluorography. Proper exposure of motion picture film requires a fluorescent screen image of certain brightness, depending on the speed of the film employed. In direct cinefluorography it has been found that a great quantity of radiation was required to achieve the level of light required for proper exposure of the film; the higher the number of roentgens, the brighter the screen image. Since excessive radiation is harmful, patients can tolerate safely only a few seconds of exposure under these circumstances. By means of screen intensification, the image brightness required by the film is obtained by electronic amplification of the image resulting from low levels of radiation. This is known as indirect cinefluorography, or cineroentgenography.

Since image intensification equipment is new, it was necessary to study the technical potentialities of the apparatus in order to establish technics which would

Presented before the Section on Roentgenology, ninety-seventh annual session, American Dental Association, Atlantic City, N. J., October 3, 1956.

This investigation was supported by a research grant, D-240, from the National Institute of Dental Research, U. S. Public Health Service.

The cinefluorographic unit described was made available to the Lancaster Cleft Palate Clinic by a research grant from the Gustavus and Louise Pfeiffer Research Foundation.

*Associate professor of roentgenology, University of Pennsylvania School of Dentistry.

†Director, technical research, Lancaster Cleft Palate Clinic.

produce good films; the work to date has been concerned with these problems. Observations based on films of patients of various age groups, with and without detectable deviations from "normal," will be reported in subsequent papers.

PRINCIPLE OF IMAGE INTENSIFICATION

The important factors influencing the fluoroscopic image are the grain size of the fluoroscopic screen, quantity of radiation, geometric unsharpness of the roentgen-ray beam, density of the part being examined, and characteristics of the human eye (when the image is viewed directly) or of the motion picture film recording the image. The fluoroscopic image is produced by the passage of numerous roentgen-ray quanta, or photons, through the patient, many being absorbed by the tissues. Those not absorbed emerge from the patient and impinge on the fluorescent screen, causing the sensitive crystals to give off visible light. Each photon emerging from the patient carries to the fluoroscopic screen some small bit of diagnostic information; the total information composing the whole image is, and can never be more than, the sum total of the information carried by each photon. It would appear, therefore, that, up to a point, an increase in the number of photons reaching the screen would result in increased diagnostic information. Radiologists are able to demonstrate this by conducting a visual fluoroscopic examination at 50 milliamperes rather than at 5 milliamperes; image detail is considerably greater at the higher value. This fact also indicates that grain size of the screen is not the major factor influencing detail.

From the foregoing it would seem that an increase in image brightness can be obtained only by an increase in milliamperage; that is, an increase in the number of roentgen-ray photons. At this point the factor of visual acuity must be considered. Sturm and Morgan[1] have shown that during conventional fluoroscopy, the human eye utilizes the diagnostic information of only 1 per cent to 5 per cent of the roentgen-ray photons received at the screen; the information is there but the eye cannot perceive it. Screen intensification, therefore, could not increase the diagnostic information reaching the screen, but if the image brightness were increased its utilization would be improved. A technical bulletin of the Philips Electronic Tube Division[2] states that this is due to the following:

> The latent (fluoroscopic) image has initial contrasts that would be visible to the cones of the fovea centralis but, on account of the low brightness level, are only observed by the peripheral rods which have only a reduced discriminative power. Here the primary advantage of the intensifier is obvious . . . it lifts the whole picture to a brightness level where the cones take over observation. These more sensitive organs can perceive contrasts where the rods failed; in other words a subliminal contrast becomes now supra-liminal and can be observed.

Morgan[3] states that an electron optical intensifier (which is the type used in this work) increases the perceptibility of the fluorescent image to a level approaching 100 per cent. Hence, in this system it is possible to use radiation levels just sufficient to carry the information to the screen, while electronic intensification of the dim image enables the viewer to perceive nearly 100 per cent of the information available. For a more complete discussion of screen intensification, the reader is referred to Morgan's[3] excellent paper.

In this work the image is recorded on motion picture film, and not visually;

1. Sturm, R. E., and Morgan, R. H. Screen intensification systems and their limitations. Am. J. Roentgenol. 62:617 Nov. 1949.

2. Philips Electronic Tube Division Technical Bulletin. X-ray image intensifying tube. 20/c/5044, E 9/54. Printed in Holland.

3. Morgan, R. H. Screen intensification: a review of past and present research with an analysis of future development. Am. J. Roentgenol. 75:69 Jan. 1956.

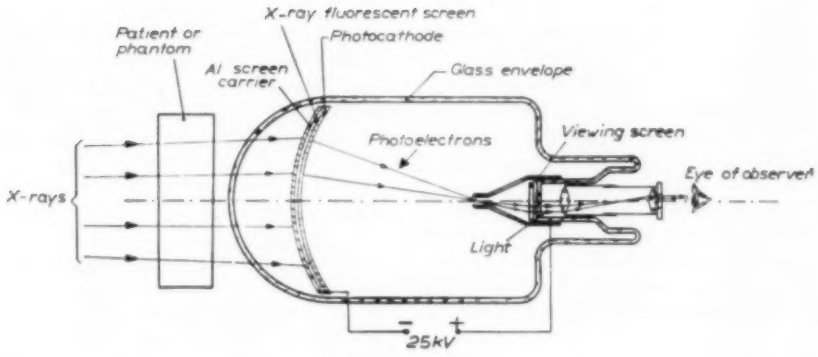

Fig. 1 • Schematic diagram of Philips image intensifier tube. (Courtesy North American - Philips)

therefore, rod and cone perception are not of primary importance. It would seem reasonable to assume, however, that if image intensification increases visual perception to nearly 100 per cent, considerably more information and greater detail would likewise be available to the motion picture film. One obvious advantage is that film of finer grain can be used, which in itself increases detail. Furthermore, less radiation reduces the hazard to the patient, and reduces the load on the x-ray tube, permitting a finer focal spot. The finer focal spot in turn reduces geometric unsharpness, thereby yielding an image of finer detail. In practice this means that the patient may be examined for a longer period of time with less radiation dosage, producing films of better quality.

IMAGE INTENSIFYING TUBE

In this work an intensifying (or amplifying) tube of the electron optical type is employed. It consists (Fig. 1) of an evacuated glass tube with an aluminum-backed fluorescent receiving screen of 5 inch diameter at one end, and an aluminum-backed phosphor layer (viewing screen) of 0.5 inch diameter at the other. The inner surface of the receiving screen is covered with a thin photoelectric layer of cesium antimony, called the photocathode. Roentgen rays cause the receiving screen to fluoresce, which in turn causes the photocathode to give off photoelectrons, which are then accelerated by a 25 kilovolt potential. During the passage through the tube they are concentrated to the 0.5 inch diameter by a simple electron-optical system, and impinge on the phosphor layer of the viewing screen. The acceleration and concentration of the electron pattern produces a gain in brightness of 1,000 times.[4] The eye of the operator, while observing the viewing screen, is protected by an optically ground lead glass disk. An f 1.5 lens of 55 mm. focal length is mounted over the viewing screen.

IMAGE INTENSIFIER—CINEROENTGENOGRAPHIC UNIT

The amplifying tube is mounted to one end of a horizontal bar, the other end of which supports the rotating anode x-ray tube (Fig. 2). The distance between these two tubes is permanently fixed, and they are so aligned that the

4. Oosterkamp, W. J. Image intensifier tubes. Metalix Bulletin 4:6 July 1953.

central ray strikes the center of the receiving screen. Power to the x-ray tube is supplied by a full-wave generator with stepless control of both kilovolts and milliamperes. The horizontal bar supporting the x-ray and amplifying tubes can be raised or lowered by a motor. The 16 mm. sound-on-film motion picture camera is mounted behind the lens of the viewing screen, and can be removed for visual inspection of the viewing screen. A lead shield surrounding the amplifying tube protects the camera operator.

Table • Calibration of roentgen output

T-S-D cm.	T-S-D in.	Kv.	Ma.	Filter (mm.)	r/min.
31	12.2	75	5.0	1.0 Al.	24.8
31	12.2	75	5.0	.27 Cu.	4.4
31	12.2	70	2.5	1.0 Al.	12.8
31	12.2	70	2.5	.27 Cu.	2.2
51	20.	75	5.0	1.0 Al.	9.2
51	20.	75	5.0	.27 Cu.	1.6
51	20.	70	2.5	1.0 Al.	4.7
51	20.	70	2.5	.27 Cu.	0.8

The patient, seated between the x-ray and amplifying tubes, is adjusted in the head positioner, and the correct position is checked on the viewing screen. The camera is then locked in position and the exposure made, a lapsed-time meter recording the duration of the exposure to 1/1,000 of a minute. Camera, sound-recording equipment, time-meter, and amplifying tube are connected by a synchronous motor to the x-ray control stand, so that one button operates them simultaneously.

The f 1.5, 55 mm. lens in the image amplifier is focused on infinity, that is, mounted 55 mm. from the viewing screen. Under these circumstances the emergent light rays are parallel. Optimum transfer of the image to the film is accomplished when the camera lens is also focused on infinity and mounted in close approximation to the amplifier lens. In order to photograph on 16 mm. film the entire area of the viewing screen, an optical lens of 1 inch focal length was employed on the camera. When a lens of greater focal length was used, parts of the image on the viewing screen were cut off the 16 mm. frames, because of optical enlargement.

RADIATION

The first step in the study was a precise calibration of the roentgen output of the tube at several distances between the focal spot of the x-ray tube and the receiving screen. The table shows the calibrations made by a radiation safety physicist. Test films were then made at varying factors of kilovoltage, milliamperage, target-skin-distance, and with several combinations of filters. When heavy filtration (0.27 mm. copper) was used, it was found that satisfactory pictures could be obtained with radiation factors ranging from 70 to 78 kilovolts, and from 2.5 to 4.0 milliamperes. Thus, with a patient positioned at a target-skin-distance of 51 cm., the dose rate would fall between 0.8 and 5.0 r per minute. By way of comparison, dental x-ray units vary in output from 0.6 to 4.8 r per second (or 36 to 288 per minute).[5-9] It is apparent that the cineroentgenographic patient receives no more radiation in one minute than a patient receives during exposure of one lower molar periapical film of intermediate speed, eight inches from the target.

Most authors consider 20 to 25 r the maximum skin dose to which cineroent-

5. Nolan, W. E. Radiation hazards to the patient from oral roentgenography. J.A.D.A. 47:681 Dec. 1953.

6. Hudson, D. C., and Kumpula, J. W. Ionization chambers for radiation data during dental x-ray exposure. U. S. Armed Forces Med. J. 6:1131 Aug. 1955.

7. Seemann, H. E., and Cleare, H. M. Reduction of x-ray dosage by filtration. Dental Radiog. & Photog. 28:61, 1955.

8. Technical Services, X-Ray Department. Principles of dental x-ray generation. General Electric Corp., Milwaukee, Wis.

9. Budowsky, J., and others. Radiation exposure to the head and abdomen during oral roentgenography. J.A.D.A. 52:555 May 1956.

genographic patients should be subjected.[10] At present, it is not envisioned that it will be necessary to expose patients to more than 10 r.

The operator and other personnel within the occupied space are protected by leaded aprons, over which they wear a radiation film badge which is calibrated weekly to show any stray radiation received. Accurate records of both patient's and operator's doses are maintained.

POSITIONING THE PATIENT

The next problem was to determine the positions of the patient's head that would produce best visualization of the region under investigation. Since the x-ray tube and image amplifying tube are fixed in line with each other at a distance which cannot be varied, any desired angle of the central ray through the head must be accomplished solely by the angle of the head in relation to this fixed ray.

Obviously, the simplest position would be to center the temporomandibular joint areas in the path of the central ray, with the midsagittal plane perpendicular to the central ray. This technic produces pictures in which both condyles are superimposed, and, while such a view is useful to show over-all jaw movement, detailed motion of either condyle separately is obscured.

In order to determine the head positions that would afford valuable visualization of only one temporomandibular

10. Lusted, L. B., and Miller, E. R. Progress in indirect cineroentgenography. Am. J. Roentgenol. 75:56 Jan. 1956.

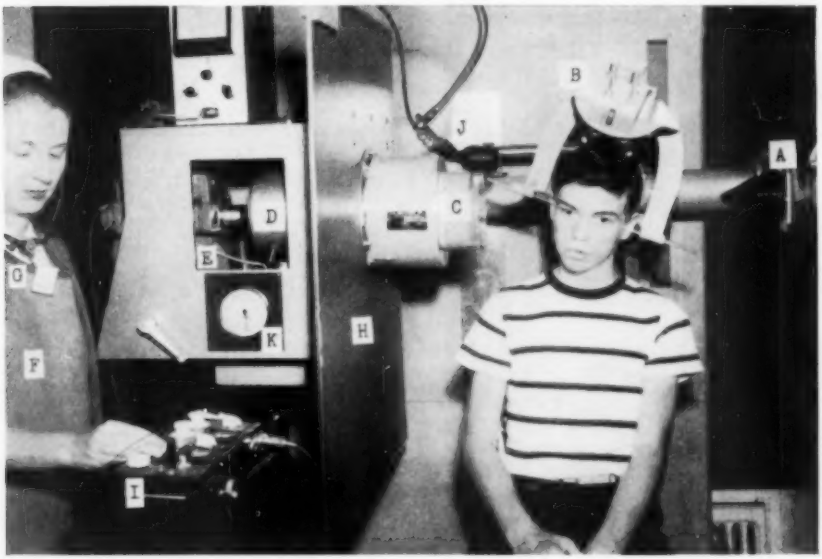

Fig. 2 • The image intensifier—cineroentgenographic unit in operation. Roentgen rays, emanating from the cone (A) of the x-ray tube, pass through the patient in head positioner (B), and strike receiving screen of amplifying tube (C). Intensified image on viewing screen (D) is photographed by 16 mm. sound-on-film camera (E). Technician, wearing lead apron (F) and radiation film badge (G), and protected by lead shield (H), checks sound level controls (I) recorded by microphone (J). A lapsed-time meter (K) registers length of exposure

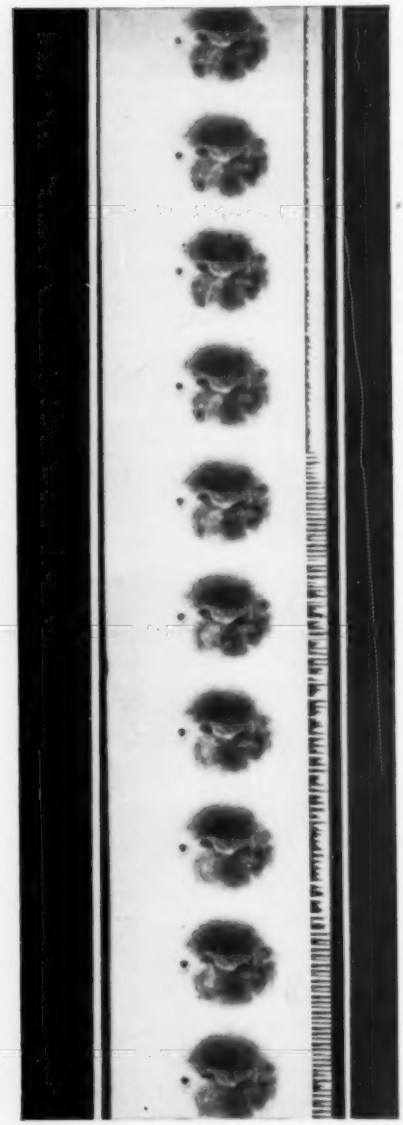

Fig. 3 • Enlargement of 16 mm. film strip taken of patient, using head position (6 in text) in which central ray enters at a point 2.5 inches superior to the left external auditory meatus and emerges through the temporomandibular articulation of the right side. Note sound track, which records pertinent research data

joint, films were run on a dry skull. The skull was mounted on a tripod which permitted either a lateral tilt or a rotation of the skull, or both. Two protractors mounted on the tripod indicated the vertical angle (lateral tilt) and horizontal angle (rotation) of each head position. Test film strips were made of the following positions, in each instance the head being so angled that the central ray passed directly through the joint under examination: (1) central ray through the sigmoid notch of the opposite ramus, (2) central ray through the center of the opposite ascending ramus, (3) central ray slightly inferior to the gonion of the opposite side, (4) central ray through the retromolar triangle of the opposite side, (5) central ray through the coronal suture of the skull, 3 inches above the zygomatic arch, (6) central ray 2.5 inches above the external auditory meatus (Fig. 3), and (7) central ray 2.5 inches above and 2 inches posterior to the external auditory meatus. In addition, an anteroposterior view, entering through the infraorbital foramen, was tried.

Study of the test films showed that all of the positions had merit. The "lateral" type views (technics 1, 2, 3, 4) show the head of the condyloid process and the neck well, but the articulating surfaces of the joint are obscured in the closed position. The "cranial-oblique" views (technics 5, 6, 7), those most often employed for spot film roentgenography of the joint, show the articulating surfaces better. Since it seems probable that several projections of each patient will be desirable, it seemed advisable to construct a head positioner which would facilitate placement of the head in any position, including anteroposterior views.

Since movement is the great asset of a motion picture study, it would not be desirable to eliminate motion completely with the head positioner. Without such a device, however, the temporomandibular area might move out of the field during the exposure. The positioner,

therefore, is to maintain the cranium in a fixed position so that condylar movement can be kept in the middle of the picture. Even with such a device, some slight movement of the cranium does occur, but if kept to a minimum is an asset rather than a liability, as it produces somewhat of a three-dimensional effect.

The positioner was designed and constructed so that the head can be positioned in three planes: forward or backward; lateral tilt (vertical angulation); and rotation (horizontal angulation). It can be used for either lateral or anteroposterior views. The headpiece, constructed of plastic, is mounted on a sliding track on the horizontal bar which supports the x-ray and amplifying tubes. Thus, the patient may be placed at any desired position between the two tubes.

ROENTGENOGRAPHIC ENLARGEMENT

During the course of some early experimental films it was noted that when the patient was not placed directly against the receiving surface of the amplifying tube, but rather closer to the x-ray tube, an enlarged or magnified image was produced. This is to be expected, of course, since it is a fundamental roentgenographic principle that a decrease in target-object distance without a proportional increase in target-film distance produces enlargement of the image. In ordinary roentgenographic work such enlargement is undesirable, since it is accompanied by blurring, or loss in the sharpness of the image border. This geometric unsharpness increases with the size of the focal spot. Most dental x-ray machines possess focal spots of 1.0 to 1.5 mm. Smaller focal spots would require the electron bombardment to be concentrated on an area so small that it could not withstand the heat generated under the usual operating factors of kilovolts and milliamperes. Rotating anode tubes permit the use of fractional focal spots (less than 1 mm.), and allow roentgenographic enlargement technics for films of certain parts of the body. Baker, Lane, and Pirkey[11] recently employed a .3 mm. focal spot to produce direct roentgenographic enlargement of the spine, and Van der Plaats[12] has pointed out its advantages in fluoroscopic work.

The x-ray tube used in this work possesses a .3 mm. focal spot. The low milliamperage possible when using the amplifying tube makes the enlargement technic practical.

Van der Plaats[12] feels that a 3X enlargement should not be exceeded when using a .3 mm. focal spot, and 2 to 2.5X is sufficient. In the equipment used in this study, the distance from the target to the receiving screen of the amplifying tube was 26 inches. To produce a 2X enlargement requires placement of the condyle under examination at a spot 13 inches from the target; the opposite side of the head would then be only 7 or 8 inches from the target. At an 8 inch target-skin-distance the skin dose would be higher than at greater distances. A film badge was used and the dose rate at this distance was calibrated and shown to be 7.2 r per minute. This compares in one minute of exposure with the amount delivered by the average dental machine in three seconds, and therefore does not make the technic prohibitive.

One of the advantages of the enlargement technic, in addition to producing a larger picture of the field, is that it makes details discernible which cannot be discerned in the smaller picture. Since the fluorescent receiving screen possesses an unsharpness of .5 mm.[12] because of the grain size of the screen, it follows that smaller details escape observation, even

11. Baker, C. D.; Lane, F. E., and Pirkey, E. L. Roentgen examination of old and new trauma of the spine with the ultra-fine focus roentgen tube. Am. J. Roentgenol. 75:144 Jan. 1956.

12. Van der Plaats, G. J. X-ray enlargement technique, a new technique in fluoroscopy and radiography. J. belge de radiologie 23:89, 1950.

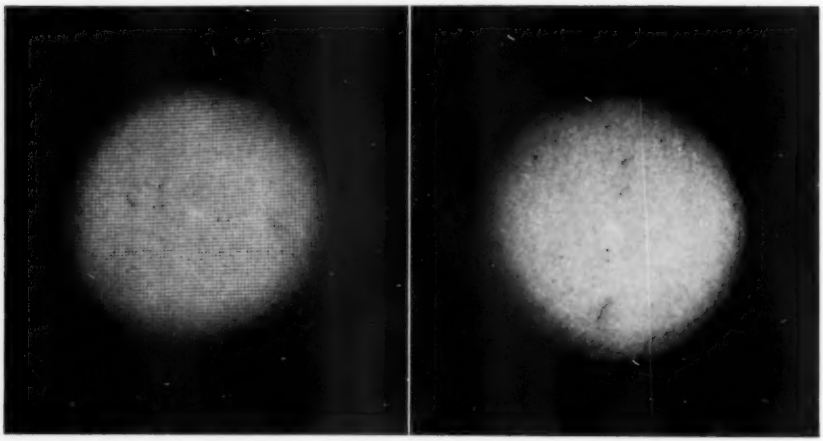

Fig. 4 • Screen resolution tests of enlargement technic. Left: Showing resolution of Tyler Standard Copper Screen, Series 35, placed 13 inches from the target. Mesh openings of .495 mm. were not discernible when the same screen was photographed at a distance of 26 inches from the target. Right: Showing resolution of Tyler Standard Copper Screen, Series 45, placed 13 inches from the target. Mesh openings of .351 mm. were not discernible when the same screen was photographed at a distance of 26 inches from the target

without unsharpness of some other origin, such as geometric unsharpness. A 2X enlargement with a .3 mm. focal spot produces a geometric unsharpness of only .3 mm., and therefore is less than the inherent unsharpness of the screen. Van der Plaats[12] states, "By enlarging more and more, the dimensions of the images of these details will exceed the dimensions of the grains of the fluorescent screen and become well visible."

To test the validity of this concept, resolution tests were conducted employing three Tyler Standard Copper Screens, supplied through the courtesy of the American Testing Laboratories, Inc., Lancaster, Pa., office. The sizes of the screens were as follows:

U.S. series equivalent	Meshes to the inch	Opening (in.)	Opening (mm.)
60	60	.0097	.246
45	42	.0138	.351
35	32	.0195	.495

Each copper screen was placed directly over the receiving screen of the amplifying tube (26 inches from the target of the x-ray tube), and was photographed on Eastman Tri X 35 mm. film. The meshes of none of the three screens were discernible on the films, showing that when a 26 inch target-object distance is employed, detail of less than .495 mm. cannot be resolved; that is, cannot be seen on the film.

The three copper screens were then placed halfway between the x-ray and amplifying tubes, a target-object distance of 13 inches, and were photographed. Films of the Series 35 (Fig. 4, left) and Series 45 (Fig. 4, right) screens showed distinct images of their meshes. This indicates that details as small as .351 mm. cannot be seen when a 26 inch target-object distance is employed, but when direct roentgenographic enlargement is used at a 13 inch distance the detail of this dimension is raised above the threshold of perceptibility.

A second test was run exactly as described earlier, except that the screens

were photographed on DuPont 931A, 16 mm. sound motion picture film, and the same results appeared. It also appeared that the detail on the motion picture film was approximately equal to that on the 35 mm. film.

In addition to increased perceptibility, another advantage of the longer patient-to-receiving screen distance employed in the enlargement technic is that scattered radiation reaching the screen is lessened. Van der Plaats[12] makes the following observation:

> Moreover, a large part of the secondary radiation will not reach the screen; this portion is deflected outward and passes alongside the screen. . . . Consequently the enlarged fluoroscopic image has better contrast, which theoretically contributes to good observation.

One other method of image enlargement is optical, achieved by utilizing a lens in the camera of greater than one inch focal length. As stated previously, such a lens would magnify the image to such an extent that all the information on the receiving screen would not be transmitted to the motion picture film. Furthermore, any unsharpness received on the receiving screen would simply be magnified.

CAMERA, LENS, FILM AND PROCESSING

The permanent 16 mm. motion picture film record is the source of data for the studies of the temporomandibular articulation; therefore, the camera, lens, and film must be capable of reproducing with great accuracy all the detail of the intensified image. Considerable time is being taken to determine the most favorable combination of camera, lens, film and processing methods. To date the following seem best suited to fulfill the objective of recording the temporomandibular articulation with a minimum of radiation to the patient, consistent with good quality of the projected films.

Camera • The Auricon 16 mm. sound-on-film camera has been used for most of the work. Additional experiments with a Pathe camera at 60 and 80 frames per second have produced slow motion pictures which show great promise. Purchase of a new high speed camera is contemplated for further slow motion studies.

Lens • Bell and Howell f 0.95 Angenieux lens with a one inch focal length was chosen because of its high speed and excellent resolution. It also produces a circle on the film containing all the information recorded on the image amplifier screen. A Kodak Anastigmat f 1.6 lens of two inch focal length has occasionally been used when it is desired to fill the entire 16 mm. frame. The latter requires more radiation to the patient, and some information on the image amplifier screen is cut off from the 16 mm. motion picture frames.

Films • DuPont 931A films provide a reasonable compromise between high emulsion speed and fine grain pattern. It is readily available in single perforated stock which permits the recording on the unperforated side of an optical sound track. On this sound track are recorded the patient's identification, and research data pertinent to the particular experiment. The 931A film is exposed in the Auricon camera at 1/50 of a second, and 24 pictures per second. For high speed (60 and 80 frames per second), Kodak Linograph Pan has proved a highly satisfactory film. The resulting contrast is good, and the grain pattern is acceptable. Tri X negative and Tri X reversal are also used when high speed is necessary. Linograph Ortho produces excellent contrast, but a somewhat grainy pattern. Experimental films have been received from several manufacturers; results will be reported at a later date.

The necessity for further experimentation with films has been brought out by Lusted and Miller,[10] who stated:

Research should continue on movie film characteristics. A more efficient fast film will allow the number of milliroentgens per frame to be decreased—for optimum film density—and thus the patient's exposure will be decreased during the cineroentgenographic examination.

Processing • Wrapping the exposed film on a 14 by 17 x-ray hanger and developing in x-ray solution produces the highest contrast and also the most objectionable grain structure. Wet film stretches so that adjacent turns sometimes overlap during development, thus spoiling important sequences. A 14 by 17 hanger will not support a 100 ft. reel of motion picture film, therefore the method was discarded for a rewind tank.

In the rewind system the film is completely submerged in the developer and alternately wound from one stainless steel reel to another until developing is complete. Unfortunately, even using a wetting agent, this developing method did not produce an image of even density over the entire length of film, so that both picture quality and sound track development were adversely affected. The time of development for any one temperature was not constant; that is, a short test strip required less development time than a full 100 foot reel.

A custom designed winding apparatus is now employed which provides even development of more than 100 feet of film at one time in a five gallon stainless steel tank.

Developing solutions have been tested to determine which produces the finest grain with a maximum emulsion speed. Kodak D-76 produces a fine grain pattern, good contrast, and permits the use of full-rated emulsion speed. Fog level on forced development, even up to an experimental solution temperature of 125°F., is hardly noticeable. D-76 has long life, and borax can be added for increased contrast.

The films are normally processed so that when projected they have a tone relationship similar to the films used in everyday practice. This is the simplest method. However, the fastest possible emulsion speed is realized if the negative image is processed by the reversal method. Chemical action converts the negative image on the film to a positive image; it is a longer and more exacting process, but with slight modification great speed can be added to the 16 mm. films. In one experiment employing the negative process, roentgenographic factors of 70 kilovolts and 4 milliamperes were required; the same film with reversal processing required only 1 milliampere at 70 kilovolts.

OBSERVATIONS FROM EARLY EXPERIMENTAL FILMS

Until a greater number of patients have been examined, any conclusions regarding this method of film making would be premature. Several interesting observations have been made, however. Chief among these were observations based on a film of a patient with a clicking joint. Clinically it appeared that the click occurred during the terminal phase of the opening movement; study of the films, taken with the microphone placed over the area to record the sound of the click, revealed that the click occurred during the initial phase of the closing movement. A slight posterior skidding of the condyle was seen as the click was heard.

With many of the fundamental technical problems resolved, work will be concentrated on studies of patients with and without joint symptoms, malocclusions, occlusal dysharmonies and artificial dentures. The results will be incorporated in future films.

Concerning the future promise of this method of investigation, Cooper and Hofmann[13] state:

13. Cooper, H. K., and Hofmann, F. A. Application of cinefluorography with image intensification in the field of plastic surgery, dentistry and speech. Plast. & Reconstr. Surg. 16:135 Aug. 1955.

It is believed that this method of cinefluorography with image intensification and sound accompaniment will prove invaluable to plastic surgeons, dentists, speech therapists, anatomists, research scientists and others in investigating some of the problems connected with cleft palate, speech and movements of the tongue and temporomandibular joint.

SUMMARY

1. A new method has been developed for making roentgen motion pictures of the functioning temporomandibular joint. With image intensification the visible light of the fluorescent screen creates an electron pattern which is accelerated and concentrated within a vacuum tube, producing an image 1,000 times brighter. The greater brightness increases the effective utilization of the information on the screen by increasing the perceptibility of dim details.

2. Electronic intensification permits lower levels of radiation to the patient. Under the conditions of this work, the patient receives approximately the same dose in one minute that he would receive from a dental x-ray machine during exposure of one lower molar periapical film of intermediate speed.

3. By moving the patient closer to the x-ray tube, roentgenographic enlargement of the area is achieved. By screen resolution tests, it was found image detail of the order of .351 mm. could be made perceptible by moving the patient from contact with the receiving screen of the amplifying tube to a position 13 inches closer to the x-ray tube. With the same technic, less secondary radiation reaches the screen, increasing film contrast.

4. Results of experiments with cameras, lenses, films and processing solutions are presented. A 16 mm. sound-on-film Auricon camera with f 0.95 lens is being used. Slow motion films at 60 and 80 frames per second show promise. DuPont 931A, Kodak Linograph Pan and Tri X negative and Tri X reversal films have produced good results. For processing Kodak D 76 is used. Reversal processing adds considerable speed to the films.

Scientific Journalism • The transmission of modern science is almost automatic; a discovery published in any scientific journal is, within a relatively short time, quoted and discussed in a number of other papers which circulate all over the world. Any scientist, working along the same line, is bound to hear of it, either directly or indirectly, and in the latter case he will have no great difficulty in obtaining a copy of the original text. *George Sarton, Introduction to the History of Science, vol. 1.*

Pain problems in the practice of dentistry: a symposium

R. Gordon Agnew, D.D.S., L.D.S., M.Sc. (Dent.), Ph.D., San Francisco

Oral pain, from the earliest history of dental care, has been the scourge which has driven suffering humanity to seek the ministrations of the dentist; and yet, it has been so intimately associated with the functions of the dentist that fear of pain has kept many from availing themselves of dental care. Until recently, relatively little attention has been paid to the basic background of the modalities of pain of the teeth, mouth and face. Local, regional and general anesthetics have facilitated intraoral restorative and surgical operations. Pulpal and periodontal pain, to a degree, have been correlated as to their clinical and pathologic aspects. The subject of so-called obscure pain of the jaws, face and head, however, has constituted a sort of "no-man's land" in which knowledge has been scanty because of unfamiliarity with the subject and because of uncertainty as to the areas of professional responsibility involved.

Contemporary investigation of pain phenomena is broadening the dentist's base of knowledge. The anatomist, the physiologist, the neurologist and the pathologist, in a general way, have mapped or postulated the pathways of communication, the nature of pain stimuli and some of the pathologic changes involved and clinical correlations. The psychologist and the psychiatrist have thrown considerable light on the problem of the psyche in relation to the total pain experience. Inescapably, the practicing dentist faces the conclusion that his field of responsibility must include an overall understanding of pain, primary or referred, in the jaws, face and head, guiding him either to cope with the situation himself, to make appropriate referral or to collaborate in further study or treatment.

In this symposium four staff members of the College of Dentistry of the University of California who established the Consultative Oral and Facial Pain Service at that institution in 1951 seek to present the problem of pain from the standpoint of the needs of the general practitioner of dentistry.

Daniel A. Collins, in describing the general characteristics of pain, points out that there is little variation in the pain threshold of a normal person from day to day or from one normal person to another but that there is a great variation in the evaluation of pain by persons manifesting different neuroses. Loren R. Borland details some of the factors involved in those variations in his paper "The Psychological Considerations in the Diagnosis and Treatment of Facial and Oral Pain." R. Gordon Agnew, in discussing the "Management of Obscure Pain," also deals with the psychological aspects of the phenomena but more specifically with the responsibility of the general practitioner of dentistry in dealing with the nature of pain and its treatment. "The Pattern and Pathways of Facial Pain" by H. Henry Weisengreen, the fourth paper in this symposium, will be published in a later issue of THE JOURNAL.

GENERAL CHARACTERISTICS OF PAIN

Daniel A. Collins, D.D.S., M.S., San Francisco

Of all the special senses, that is, sight, hearing, smell, touch and so on, pain is probably the most personal. Pain experience can hardly be expressed without the use of personal pronouns such as "I" or "my." There is a personal involvement in pain perception which does not allow the patient the opportunity of relief such as he may obtain when, for example, he turns away from the line of vision, or closes his eyes to something unpleasant, or turns off the radio when something irritating to him is being broadcast.

There is little cause for wonder, then, that pain experience is subject to such varied personal interpretations, since all the combinations of an individual's personality traits or neurotic tendencies may be involved. This personal involvement is further complicated in the normal person by the fact that painful experience is always unpleasant.

To rid himself of a painful experience in and about the mouth, the patient has two courses of action: (1) self-medication or endurance to withstand the experience till natural forces bring relief; (2) recourse to the services of an expert, the dentist.

More and more the dental profession is employing knowledge of pain as a diagnostic tool, taking full advantage, as knowledge of the fundamentals of pain phenomena increase, of its warning signals. The time is approaching rapidly when all dental curriculums will include required courses in the fundamentals of the pain mechanism.

These basic principles, as developed primarily by the neurologist, are pertinent to the teeth and their associated structures and are worthy of brief review. The fundamentals which it is believed will be of value to the dental practitioner are consequent to the work of Wolff and Wolf,[1] Lewis,[2] Livingston,[3] White and Sweet,[4] Bonica[5] and others and have been further refined by observations in the oral and facial pain investigative project at the University of California. A brief review of the following basic aspects of pain with suggested applications to oral conditions will be attempted:

1. Qualities of pain as related to tissues sensitive to pain.
2. Localization of pain.
3. Spontaneous pain.
4. The differentiation of types of "tenderness."
5. Pain threshold.

QUALITIES OF PAIN

Only three basic qualities of pain have been recognized by specialists in this

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1. Wolff, Harold G., and Wolf, Stewart. Pain. American lectures in physiology. Springfield, Ill., Charles C Thomas, 1948.
2. Lewis, Thomas. Pain. New York, The Macmillan Co., 1942.
3. Livingston, W. K. Pain mechanisms. New York, The Macmillan Co., 1944.
4. White, J. C., and Sweet, W. H. Pain, its mechanisms and neurosurgical control. Springfield, Ill., Charles C Thomas, 1955.
5. Bonica, John J. Management of pain with special emphasis on the use of analgesic block in diagnosis, prognosis and therapy. Philadelphia, Lea & Febiger, 1953.

field: (1) bright or pricking pain; (2) burning pain and (3) aching pain.

These basic pain patterns may vary in intensity from mild to excruciating.

Bright or pricking pain is that produced by a momentary contact on the skin or the mucous membranes of the mouth, anus, pharynx, larynx, nasal cavity with its sinuses, and the middle ear, with a source of painful stimulus such as the electric current, a hot instrument, a pinprick or a chemical irritant. It is important to note that the quality of the painful sensation is similar regardless of the form of the noxious stimulus. For the most part, tissues experiencing bright or pricking pain are derived from the ectoderm.

Burning pain is that mediated by the same tissues just mentioned; namely, the entire cutaneous surface and the mucous membrane of the mouth, anus, pharynx, larynx, nasal cavity and its sinuses, and the middle ear, under conditions of contact with a painful stimulus such as those enumerated previously.

The important factor to be remembered in the differentiation of these two qualities of pain is the duration of contact between these tissues and the noxious stimulus. In general, momentary exposure of ectodermal tissue to a noxious stimulus will result in bright or pricking pain, whereas prolonged stimulation of these same tissues will give rise to burning pain. The source of the noxious stimulus plays no part in the quality of the pain pattern except that different degrees of tissue damage may follow the original injury. For instance, prolonged prick from a needle will produce a burning pain which will cease when the needle is removed, whereas burning pain resulting from prolonged contact with a hot instrument may continue after the removal of the hot instrument because of tissue damage.

Aching pain is of that type which may be experienced by tightly squeezing the web between the fingers. This quality of pain is produced primarily in mesodermal tissues—muscle, fascia, periosteum, blood vessels and joints. Again, the source of the noxious stimulus does not determine the quality of the pain. The severity and duration of the painful sensation, however, are related to the source of the noxious stimulus.

These fundamentals may be applied in the diagnosis of pain in and about the mouth when the dentist is familiar with them, and the patient is carefully questioned and informed as to the nature of pain. According to Lewis,[2] painful stimulation of the skin, as well as other ectodermal tissues, will produce protective reflexes such as tapping of the feet, vigorous kicking or other brisk movements, rise of pulse rate with a sense of invigoration and so forth, whereas stimulation of the deeper tissue (derived from the mesoderm) is associated with quiescence, slowing of the pulse rate, fall of blood pressure, sweating and nausea.

LOCALIZATION OF PAIN

For the most part localization of pain in the skin and the mucous membrane, lips, gingivae and tongue is very accurate, whereas localization of pain in subcutaneous tissue, fascia and tendons is less accurate. In the more superficial periosteum, as in the tibia, sternum, olecranon, mandible or maxilla, the ability to localize pain is more or less accurate, whereas pain is more diffuse in the more deeply lying periosteum, such as that of the infraspinousa fossa or the pelvis where it is well covered. Pain in the joints is more diffuse, especially in those which lie deeply.

A number of studies of the localization of pain in the pulps of the teeth have been made. According to Noyes,[6] if several pulps on the same side are exposed,

6. Noyes, F. B. Noyes' Oral histology and embryology, ed. 7, revised by Schour, Isaac. Philadelphia, Lea & Febiger, 1953.

including those in both the maxillary and mandibular arches, so that they can be stimulated without reception from the periodontal membrane, and if the patient is blindfolded, it will be impossible for him to localize the tooth which has been stimulated. The pain from a single tooth may be referred to almost any point, on the same side, supplied by the trigeminal nerve.

These fundamental aspects of the localization of pain become important clinical factors in determining the particular tooth responsible for a toothache. On many occasions knowledge relating to the localization of pain has helped to locate the correct tooth in diagnosing simple toothache. Most dentists are undoubtedly familiar with the situation in which a disturbed patient points to a perfectly healthy tooth in one jaw (especially if a dark spot, defective filling or other visible or palpable defect is present), whereas the "culprit" is eventually found in the opposing jaw.

SPONTANEOUS PAIN

Another fundamental aspect of pain which is of value in everyday diagnosis is the production of spontaneous pain. Everyone has had personal experience with the hyperalgesic state after a sunburn. Entrance into a warm room resulting in elevation of the injured skin temperature to that of body temperature will produce spontaneous pain. This may be referred to as a hyperalgesic state in the skin. The noxious stimuli are the rays of the sun which have been in contact with the skin long enough to produce an erythralgia, resulting in hyperalgesia, thereby rendering the skin hypersensitive to otherwise normal stimuli. If a tooth is sufficiently injured as a result of dental caries, trauma or other noxious stimuli, a state of hyperalgesia may develop to such a degree that normal body temperature or pulsation of the heartbeat will precipitate spontaneous pain.

DIFFERENTIATION OF TYPES OF TENDERNESS

In the diagnosis of a pain syndrome, differentiation of types of tenderness is of value. Clinical symptoms can be of great assistance in differentiating pain due to injury of the skin itself from that due to a lesion primarily of the peripheral nerves. In both instances tenderness may be the subjective symptom.

According to Lewis,[2] in tenderness due to primary changes in the skin, whereby the local nerve endings are rendered hyperexcitable to stimulation, two clinical phenomena appear: (1) the skin responds painfully to warmth from 40°C. and (2) rubbing the skin or stretching it produces not only immediate pain, but recurrent pain after an interval of several seconds. This recurrent pain may be of considerable duration. On the other hand, when tenderness and pain in the skin are due to pressure or other injury to the nerve root supplying the part, the tender skin behaves in a different manner: (1) moderate warmth will not produce pain and (2) friction is painful but there is no recurrent pain pattern. Here, again, knowledge of the general characteristics fundamental to the mechanism of pain, although subtle, can be of practical value in the evaluation of the pain syndrome and facilitate correct diagnosis.

PAIN THRESHOLD

One further factor basic to the understanding and use of pain as a diagnostic tool is pain threshold. This may be described as that level of irritation by a noxious stimulus at which a painful or unpleasant sensation is perceived by the patient.

According to the observations of Wolff and Wolf,[1] there is little variation in the pain threshold from one person to another, or in the same person from day to day. In this summarization these authors were referring to normal persons.

Observations made during the investi-

gative project at the University of California likewise indicate that, in normal persons, painful experience under similar conditions involving the mouth and associated structures does not vary considerably from person to person. There is, however, great variation as to the subjective evaluation of pain involving the mouth and associated structures between persons manifesting different neurotic states. Unfortunately, so many patients seen by the dentist in everyday practice display neurotic reactions to pain. Some of the factors involved in these reactions will be discussed in more detail elsewhere in this symposium by Loren Borland.

THE MANAGEMENT OF OBSCURE PAIN BY THE GENERAL PRACTITIONER

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The responsibility of the general practitioner of dentistry in dealing with the nature of pain, pain pathways and psychological considerations has assumed new and increasing proportions. His interest cannot be restricted to an understanding of the significance of pain patterns associated with pulpal disturbances, with mucosal, gingival and periodontal disease or with technical or surgical procedures. Inescapably, he will be called on to concern himself with affections of the masticatory musculature, with temporomandibular joint dysfunction or with "obscure" pain of the jaws or face.

To be sure, conditions of unusual complexity, baffling in etiology or demanding special skills in therapy, may be referred to those specializing in such problems. In conditions in which after careful study and elimination, the mouth and its components would seem to play a minor role, referral to a neurologist is indicated. Similarly, when history-taking has demonstrated the existence or likelihood of significant neurotic or psychotic disturbance, the dentist ordinarily will refer the patient to a psychiatrist or psychoanalyst. However, in all cases, prior to acceptance, referral or cooperative handling, there must be a recognition of the over-all nature of the problem, an analysis and screening which will enable the practitioner to choose the appropriate course of action. Such discriminative skill, it is believed, increasingly will reveal to him pain problems which fall dominantly within the purview of the dental profession.

SCOPE OF THE PAIN PROBLEM

Three categories of pain are of concern to the dentist. The first is pain originating in the "dental" or associated tissues, such as the dental pulp (dental caries, attrition, abrasion, erosion, trauma and so forth); the periodontal tissues (lesions of gingivae, periodontal membrane, parietal or periapical bone); bone of the jaws (nonperiodontal); the temporomandibular joint and the masticatory musculature; the mucosa of the mouth (including lips, tongue and palate) and the adjoining facial structures (skin, salivary glands, sinuses and so forth).

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The second category includes pain referred from dental and associated structures to other regions, for example, noxious stimuli originating in the dental region and referred to other divisions of the trigeminal nerve or to the cervical region.

The third category includes pain referred from other regions to dental or associated zones, for example, pain referred from the maxillary sinus to the upper posterior teeth, or from the cervical region to dental zones.

CLASSIFICATION OF PAIN PHENOMENA

In fields still requiring much clarification, classifications may imply an unjustifiable certainty. They are, however, of value. A reasonably comprehensive listing of pain phenomena would include the following classifications.

Neuritis • Under the classification of neuritis would come pulpitis; postextraction osteitis; periostitis; maxillary sinusitis; trigeminal neuritis (herpes zoster); osteomyelitis; traumatic neuritis (including neuroma formation); facial paralysis (Bell's palsy), and neuritis accompanying systemic disease (syphilis, chemical poisoning and vitamin deficiencies).

Neuralgias • There are four kinds of neuralgias: major neuralgias, minor neuralgias, atypical neuralgias and psychalgias.

Major neuralgias include trigeminal and glossopharyngeal types (so-called tic douloureux).

Minor neuralgia is an extensive category including the following:

1. Neuralgias involving the teeth and periodontal tissues (odontalgia, periapical and pericoronal infections, lateral periodontal abscesses and so forth).
2. Neuralgias involving edentulous areas (residual or focal infective zones, neuroma formation and other intraosseous lesions).
3. Neuralgias involving nasal and sinus lesions.
4. Neuralgias involving the temporomandibular joint (so-called Costen's syndrome and other neuralgias).
5. Myalgia (masticatory muscles).
6. Traumatic neuralgias (causalgia and so forth).
7. Neoplastic neuralgia.
8. Neuralgias of systemic disease origin (cardiac, syphilitic and avitaminous).
9. Postherpetic neuralgia after herpes zoster.
10. Neuralgia after intraoral mucosal infection.
11. Neuralgia of vascular origin referred to any facial area.

Atypical neuralgias are various facial neuralgias involving "trigger mechanisms" (other than major "tic"); facial twitching and so forth, and Hunt's syndrome.

Psychalgias are neuralgias of psychogenic origin.

Pain of Dominantly Psychogenic Origin • Various chronic neuralgias of face and jaws are dominantly psychogenic in origin.

Headaches • Types of headaches include: (1) migraine; (2) histamine; (3) those which are of systemic origin; (4) those of local origin and (5) those from tension. The overlap of this category with the neuralgias can be noted.

CASE HISTORY

Case history taking in dentistry is attaining new status with the growing recognition of the interrelationships between mouth and body health. Pain analysis necessitates painstaking and comprehensive examination and recording. A good part of such procedure is basically identical with the technics and sequence

requisite to modern oral diagnosis; hence it is necessary here only to discuss specific aspects pertinent to pain phenomena.

The preliminary health questionnaire, answered by the patient while awaiting his appointment, is of proved value. Recording systems, whether of the diagrammatic, check-square or written types, are usefully supplemented with a pain chart graphically locating the pain distribution. The classic sequence—chief complaint, present illness, past history, family history and so forth—should include special emphasis on the characteristics, past and present, of the pain pattern.

Examination must, of course, include meticulous evaluation of soft and hard tissue status, including roentgenographic evidence and pulpal and other tests. In addition, it will often be necessary to direct special attention to the status and function of the masticatory muscles, to maxillomandibular relationships and, to a reasonable extent, to the condition of those of the cranial nerves which may be involved. Psychological observations, based on a general understanding of personality and of behavior problems, should be made from the time of first contact with the patient and should be recorded.

Medical, neurologic or psychiatric consultations may be of great importance. Not infrequently, the need for such consultations becomes obvious only after the dentist has concerned himself, not with the mouth alone, but with his patient as a physical and psychological entity of which the mouth and jaws constitute an integral part.

The establishment of effective rapport between patient and examiner is mandatory to success; and final diagnosis may, of necessity, be deferred or may be preceded by "diagnosis-therapy," that is, by tests and procedures which may not only have therapeutic or palliative value, but which also may play a confirmatory or directive role in pain analysis.

RECORDING NATURE AND DISTRIBUTION OF PAIN PATTERN

A vital phase of pain analysis is the recording of the nature and distribution of the pattern. This analysis should include the following.

The location of pain, its major focus or foci; distribution of the pain pattern, topographical sequence, if any, in the pain experience and the precise location of "trigger points," if present, should be determined.

The quality of characteristics of the pain, such as whether it is bright, pricking, burning or aching, and other descriptive detail, such as whether the pain is lancinating, cutting, pulling or itching, should be established.

Knowledge of time factors, such as occurrence; duration; whether there is an intermittent or continuous pattern, or whether it is pulsatile; whether there is a wavelike rise and fall in intensity; length of interval between attacks and so forth, is helpful.

Association factors, that is, circumstances or conditions related to occurrence, increase or decrease, for example, while the patient is eating, coughing, sneezing, talking, yawning, laughing, standing, lying down and so forth, should be determined. Other association factors include weather conditions, emotional disturbances and mental concentration on "pain."

The severity or intensity of the pain should be established. Accurate clinical measurement is impossible, of course, because of the subjective character of pain and the wide spectrum of the total pain experience. Tests of pain threshold and so forth are not yet clinically practicable. Knowledge of the relative intensity of pain over periods of time or during therapy may be of value, also information from friends or relatives of the patient. Shrewd observation is necessary, and placebo injections or other medication may be instructive.

The dentist should know of previous therapy or agents found to alleviate pain, such as past effective medication; physical methods of relief (heat, cold) and specific treatment previously administered.

Determination of other somatic phenomena, that is, any disturbances of the body as a whole, or of an organ or region, apart from the conditions listed above, which may accompany or follow an attack of pain, is of importance.

SPECIAL ASPECTS OF EXAMINATION

Meticulous examination of the hard tissues of the teeth, evaluation of pulpal and periapical status, analysis of periodontal conditions and survey of edentulous ridges utilizing high quality roentgenograms of adequate number and type and employment of one or more methods of testing pulpal response to stimuli ordinarily will reveal to the diagnostician many of the conditions which experience has linked with pain. Such procedures are accepted as part of the diagnostic requirements of good practice. They are often insufficient, however, for pain analysis.

Seldom is the simple technic of palpation of the tissues of the lip and of the muscles accessible from the mouth included, yet this brief step, consuming but a few moments, may yield information as to alterations in contour, texture, temperature and sensibility which may be of vast importance. This technic has been described aptly as the "inquiring oral finger." By this means, not only may the dentist have his attention directed to early neoplasms, cysts and other lesions which might otherwise go undetected, but areas of pain, muscle spasm, surface hyperalgesia, local deep tenderness, numbness (paresthesia), anesthesia or abnormal temperature may come to light. Further, the dentist may, if he desires, employ rather simple methods for evaluation of the function of the cranial nerves or at least of those most related to his field, such as the trigeminal, facial, glossopharyngeal and hypoglossal nerves.

The temporomandibular articulation must be checked carefully. In many instances pain analysis will be focused in this region and detailed information is necessary. It is usually convenient and logical to examine the masticatory musculature at the same time, since muscle imbalance and strain constitute one of the commonest sources of symptoms. The temporomandibular joint may be systemically involved as a part of a generalized arthritic process, that is, rheumatoid arthritis or an osteoarthritic tendency; as a manifestation of a systemic disease as in septicemia, scarlet fever or tuberculosis; or as an involvement of some infectious process in adjacent structures, as in furuncle in the anterior wall of the external auditory meatus.

More commonly, local lesions are culpable.

1. Traumatic arthritis may result from the following:

a. Decrease of intermaxillary space due to premature wear of teeth, faulty restoration of missing teeth or inadequate adjustment of denture wear.

b. Discrepancy between centric relation of the jaws and the so-called convenience occlusion of the teeth.

c. Naturally occurring or artificially caused malposition or malocclusion of teeth, interfering cusps, "locked bite" or nonequilibrated artificial teeth.

d. Abnormal stresses on the joint, whether episodal, as in accidents and blows, or chronic, as in muscular imbalance from any of the previously named causes, or from injurious habits, such as bruxism.

2. Subluxation of the jaws, in which stretched or relaxed capsular and joint ligaments permit abnormal joint movements, "clicking," "popping" and so forth, often is due to faulty condylemeniscus relationships or to serious damage to the meniscus.

3. In dislocation of the jaws, the source of pain is usually obvious.

4. Ankylosis is a condition in which unilateral lesions frequently involve pain as well as deformity.

The widely described "Costen's syndrome" is not a very helpful concept, since all the described symptoms rarely may be present and since the cause may range over many of the local factors listed previously.

In diagnosis, the dentist should check for facial asymmetry and should palpate the accessible masticatory muscles (such as the masseter) for tonus, relative size and tenderness. He should observe closely the facial midline during opening and closing movements, noting any deviations and should palpate the condyles at rest and in function (listening to uncertain joint sounds with the stethoscope is helpful). Any discrepancy between the seemingly normal closure of the jaws (centric jaw relation) and the "convenience closure" of the teeth should be noted carefully, and occlusal interferences in centric or eccentric movements should be observed in detail, along with evidences of wear excessive for the age and type of patient. The pad test for vertical dimension abnormality may be of value.

Roentgenograms of the temporomandibular joint, especially the laminagram or cephalogram, are useful adjuncts, to be studied with due regard for their limitations. They may throw light on excessive or limited joint mobility, condylar displacement, lack of symmetry between condyle and fossa, flatness or steepness of eminences and surgical conditions.

The experience of the staff of the Consultative Oral and Facial Pain Service has established the importance in the causation of pain of the manifold and often severe disturbances which may be caused by occlusal disharmony in centric or eccentric relation. The consequences of such disharmony may range from annoying clicking of the joint to neuromuscular disturbances and severe pain of jaws, joint, face or head. Of great importance is the recognition of the "locked" or "chopping bite" in which gliding movement is impossible. Here, pain of neuromuscular origin frequently is found, and relief through equilibration may be dramatic. (Pruzansky[1] found different electromyographic patterns in the "grinder" and in the "chopper" type of mouth.)

As in all pain problems, the perceptive threshold may vary with the psychic status of the patient.

Pulpal examination and tests and the observation of pulpal pain phenomena are not included in this paper in view of their coverage in contemporary dental literature.

PAIN ANALYSIS

In the course of examination, when the dentist has become familiar in a general way with conditions in the mouth, he may organize his analysis in a natural sequence.

First, the dentist will seek to localize accurately the lesion basically responsible for the pain pattern. This procedure frequently may be attended with little difficulty. For example, the capacity of the periodontal tissues to allow precise localization of pain stimuli is widely known. Just as widely known, however, is the possibility of error in the localization of some types of pulpal pain.

Pain of the jaws may present difficulties not only in the precise localization of the focus of a diffuse pain, but also in a differentiation of the original or true source of the lesion from pain which may be referred not only to other sites in the distribution of the same nerve, but to areas within the distribution of other

1. Pruzansky, Samuel. Application of electromyography to dental research. J.A.D.A. 44:49 Jan. 1952.

nerves. Such referred pain may be confused further by hyperalgesic phenomena in the terminal distribution of the nerve to which referral has been made. Test injections of anesthetic solutions may permit the dentist to make this important differentiation and to establish the seat of the disturbance.

Second, the dentist must determine, if possible, the organic pathologic changes which have occurred, whether they are from dominantly local cause (traumatic, infective, or neoplastic) or whether they are local manifestations of systemic disease. This phase of the analysis may again be relatively simple, or may tax the resources and skill of the dentist and his consultants, whether they are dental or medical.

One or several hypotheses as to causation may be entertained; and it may be necessary to carry out a type of diagnosis-therapy in order that such hypotheses may be validated or rejected. For example, temporomandibular joint dysfunction may be patently present, or severe occlusal disharmony may exist. Unilateral mastication with distortion of muscular function may be of long standing. The bruxism habit may be firmly established. Such conditions indubitably have been associated causally with severe pain of the jaws and face. Before a diagnosis may be established, it may be necessary to relieve or correct such conditions, thus permitting a pragmatic test as to the accuracy of the hypothesis.

Third, the dentist, in many instances, must evaluate, as far as is feasible, the significance of psychogenic factors. These may play a minor or a major role. Rarely, if ever, are they present to the exclusion of at least minor organic components.

Finally, the diagnostician is prepared to affirm his diagnosis (or, in complex situations, his tentative conclusions) and to outline a plan of treatment (if such has not been accomplished in his diagnosis-therapy), rehabilitation and prevention.

THERAPY OR DIAGNOSIS-THERAPY

Therapy of oral and facial pain covers a wide range from well-proved agents, often of definite but restricted value, to recent methods of treatment, sometimes of empiric or uncertain nature. As indicated previously, therapy may be instituted, in many instances, as a measure directed toward both confirmation of diagnosis and relief of pain. Treatment is based on various therapeutic objectives.

Organic Level • Treatment on the organic level can be accomplished in several ways.

Alleviation of Pain • Pain can be alleviated in the following manner:

1. Raising of the pain threshold can be done by means of drugs which depress the brain centers involved in the reception of pain impulses, including sedatives, hypnotics, analgesics—opium derivatives, bromine derivatives, barbiturates and so forth.

2. Specific drug or chemical therapy can be attempted with vitamin B_1, B_{12} or C; hydrocortisone; reserpine; chlorpromazine hydrochloride; Protamide; ergotamine tartrate; various antispasmodics and muscle relaxants, such as mephenesin and Equanil.

3. Physiotherapy, that is, hot or cold applications, muscle training or improvement of posture may alleviate the pain.

Interruption of Pain Pathways • The pain can be interrupted in two ways.

1. Nonsurgical interruption can be achieved on a temporary basis through local, regional or intravenous injection of anesthetic solutions or through general anesthetics. Pain of possible vascular origin should not be overlooked in local and regional treatment. Semi-permanent interruption can be achieved by means of

injections of alcohol or repeated local or regional injections of anesthetics. Periods of relief may far exceed the immediate pharmacologic action of the anesthetic.

2. Surgical interruption can be accomplished through avulsion of peripheral nerves, section of sensory nerve roots (that is, retrogasserian), trigeminal tractotomy and so forth. Temporomandibular joint surgery may include meniscectomy or condylectomy.

Elimination of Noxious Stimuli • There are various methods of eliminating noxious stimuli.

1. Surgical intervention can eliminate noxious stimuli by the removal of impacted teeth and root fragments and by elimination of abscesses, cysts, residual infection areas, tumors, ulcers and so forth. Alveolectomy and extirpation of scars and neuromas are other surgical methods of eliminating noxious stimuli. The experience of the Consultative Oral and Facial Pain Service has demonstrated the definite association of neuromas of the dental tissues with chronic pain.

2. Correction of occlusal disharmonies by integration of centric occlusion of the teeth with centric relation of the jaws, establishment of "gliding articulation" and freeing of the "locked bite" can also be useful in eliminating noxious stimuli.

3. Temporomandibular articulation correction can be made through repositioning of the condyle (nonsurgical repositioning, through prosthetic or operative procedures); associated muscle retraining; test-repositioning through the use of soft (latex) or hard acrylic splints, and the use of sclerosing solutions.

4. Treatment of bruxism through occlusal correction, muscle retraining and oral rehabilitation is another method. The use of soft or hard splints is often of definite value.

5. Muscle relaxants and antispasmodics aid in the elimination of noxious stimuli.

6. Other dental methods, such as the reduction of pulpal inflammation through the use of calcium hydroxide, are used for the correction of function of the teeth and jaws in treatment of oral and facial pain.

Therapy on Psychological Level • Psychological therapy may be such as lies within the scope of the skillful and understanding dentist in the course of his intraoral treatment or it may be such as will require the services of the psychiatrist, the psychoanalyst or other psychological personnel. Frequently, such therapy may be carried on concurrently with dental treatment.

The responsibility for recommending and perhaps arranging for psychological consultation often rests on the dentist. With a view to the possibility of making available to the dentist tests or criteria helpful in the decision as to the need for such consultation, the Consultative Oral and Facial Pain Service is currently experimenting with personality surveys of accepted value in other situations, to evaluate their usefulness to the general practitioner.

Prevention of Obscure Pain • An aspect of the problem of prevention of oral and facial pain would seem to merit increased attention. The minimizing of intraoral and extraoral operative trauma is of high importance in the reduction of incidence of neuritis, causalgia, neuroma, nerve impingement through scar formation and paresthesia.

PSYCHOLOGICAL CONSIDERATIONS IN THE DIAGNOSIS AND TREATMENT OF FACIAL AND ORAL PAIN: SOME APPLICATIONS OF COMMUNICATION THEORY

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The understanding and treatment of obscure oral and facial pain draws heavily on the observations of such disciplines as anatomy, physiology, pathology, roentgenography, pharmacology and so forth. The dentist is indebted deeply to each of these sources, and many others as well, but he must be very careful that his borrowing—quite proper in matters of data—does not include the acceptance of the impersonal "laboratory" frame of mind within which these data were developed. The physiologist finds his study of tissue function quite adequate without considering such variables as emotions; and perfused tissue preparations offer a much tidier approach than do conscious human beings. In contrast to this, pain cannot exist in the absence of consciousness, and cannot be understood and treated without a full consideration of the emotional life of the patient.

The functional relationships existing between the patient's emotional conflicts and the process of diagnosis has been dealt with in some detail in the literature.[1,2] Emotional characteristics of his patients confuse the dentist's diagnostic efforts by virtue of their influence on the following: (1) the patient's perceptual and cognitive processes; (2) the process of communication between patient and diagnostician and (3) the response of the patient to therapeutic measures.

The vast majority of the data which confront the dental diagnostician consists of subjective reports by the patient himself. This is especially true in the case of obscure pain. Such objective-appearing procedures as vitality testing depend, in a critical way, on the patient's own, and therefore subjective, report of his own perception and evaluation of certain standard stimuli. The organization of sensory impulses into a conscious percept is an exceedingly complex process, one which is the resultant of many simultaneously operating variables, and, consequently, susceptible to distortions of many kinds and from many sources. Since this organizational process occurs entirely within the patient, and is, therefore, quite beyond the dentist's critical scrutiny, the dentist must be ready to accept the patient's statements as meaningful, but only partially correct.

Experimental studies show that what is perceived is, to a significant extent, a function of what the subject wishes to see. Momentarily presented words and phrases which are acceptable to the person's set of values are more readily perceived than are those which are in opposition to the value system.[3] In a similar fashion, the complaints and symptom descriptions of patients are derived in part from the sensory impulses involved and in part from the emotional needs of the patient. Alexander[4] says:

> . . . every organic symptom has an emotional significance for the patient of which his ego takes advantage for the relief of emotional conflicts. Often the mere fact of being organi-

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Chairman, section of psychology, University of California College of Dentistry.

1. Borland, L. R. Hysterical symptoms as a factor in oral diagnosis. Oral Surg., Oral Med. & Oral Path. 6:444 March 1953.

2. Weisengreen, H. H., and others. An approach to the problem of facial pain. J.A.D.A. 48:33 Jan. 1954.

3. Postman, L.; Bruner, J. S., and McGinnies, E. Personal values as selective factors in perception. J. Abnorm. & Social Psychol. 43:142 April 1948.

4. Alexander, Franz. Psychosomatic medicine: its principles and applications. New York, W. W. Norton & Co., 1950, p. 269.

cally ill is important . . . it allows regression to a more infantile dependent attitude.

Many different effects can be introduced in this manner. The need for sympathy or attention, a desire to be dependent, the wish to inflict unhappiness and inconvenience on relatives, a tendency to use personal ailments as a means of gaining control over other members of the family—all are illustrative of the kinds of needs which can function to increase the severity of the perceived symptom and even, at times, to manufacture it out of thin air. Other kinds of needs may serve to de-emphasize the symptom so that it is given less attention than it deserves.

On a more conscious level, the interpretation of the percepts may be distorted even before they are verbalized to the diagnostician. Thus, a certain set of sensations may suggest the possibility of cancer to certain patients. If these people are neurotically afraid of cancer, they may neglect to report these sensations, or otherwise distort or minimize them, for fear of having to face a diagnosis of cancer.

Weiss and English[5] have pointed out the following:

In approaching the patient from the standpoint of psychosomatic diagnosis one must realize that in dealing with the emotions one cannot separate treatment from diagnosis. . . . There is no sharp division between the period of diagnosis and the period of beginning treatment.

This has certainly proved to be so where obscure pain is the chief complaint. Many of the dentist's diagnostic data come from his observations of the patient's response to various therapeutic procedures. Such procedures should be rational as far as possible and be based on some working hypothesis as to the basis for the pain. The response of the patient serves to verify the hypothesis in some cases, and may serve to complete the diagnostic formulation. In other instances, the patient's responses may indicate that certain avenues of approach are not sufficiently promising to be pursued further.

It should be noted, however, that the patient's description of his response to therapy is as susceptible to distortion as is his account of his symptoms. Factors which provide for the creation or exaggeration of symptoms in the first place will also tend to minimize the patient's reported progress in therapy. Conversely, those influences which acted initially to minimize the importance of symptoms may sway the patient to report more therapeutic success than has really occurred. Much could and should be said about the psychodynamics involved in these distortions. The remainder of this paper, however, will be concerned with a much less inferential aspect of the diagnostic process—the communication between the patient and the dentist.

COMMUNICATION

For the purpose of this paper, communication will be defined as an exchange of information. In many respects this process is the same whether it occurs in an electronic circuit such as a record player or on a verbal level between two individuals in a vis-à-vis situation. In both instances the information being exchanged is distorted to some extent, some of the original data are omitted or lost in the process of exchange and some of the output gets fed back into the transmission process, resulting in further distortion.

The interest in "high fidelity" today illustrates an attempt to eliminate as much distortion as possible, and may, therefore, serve as a model for the dentist's approach to the pain patient. It also serves as testimony to the fact that what is on the record does not, in a complete and unaltered form, find its way to the ear of the listener. Each new development in the "high fidelity" field is

an improvement at the moment, but is destined eventually to be replaced by something better.

In the best of sound systems, some noise is heard which is a product of the system itself and does not exist on the record. Noise may be thought of as something extraneous which is added in the process of communication and which did not exist as a part of the original data. It does appear, however, on the receiving end, and in doing so it lowers the fidelity of the communication. The best amplifiers designed for use in record players contain within their circuits built-in distortion designed to compensate for known distortion existing in the records. The more elaborate arrangements now provide selector switches which enable the listener to choose a given type of intentional distortion (really a correction) depending on the type of record being played.

Early in the history of electronics, feedback was a common problem for the engineer, and, in some instances, still is. If some of the signal near the output of a system is routed back and introduced at an earlier point in the chain, some noticeable distortion may occur. Everyone has heard the screech which results when the volume is turned up too high on a public address system. This happens because some of the sound from the loud-speaker is picked up by the microphone and fed back into the system. This same effect occurs to a considerable degree in verbal interpersonal communication.

It would be well at this point to recall that the definition of communication was an exchange of information. The word exchange implies a flow in both directions, and this concept is necessary for an understanding of the communication process. All interpersonal relationships consist of a constant interchange on the verbal level as well as in terms of actions, facial expressions, gestures, postural changes, vocal inflections and so forth. The speaker constantly is being influenced by his perceptions of the reactions of the listener. He may even be influenced to a considerable extent by the sound of his own voice. Everyone has heard someone say, "I didn't realize what it would sound like until I heard myself say it." It is one thing to consider something in the privacy of our own thoughts, and quite another thing to say it aloud.

It must be accepted as fact that the feelings and sensations of another person can never be communicated in their entirety. Some of the details will always be omitted, and these may be quite unimportant or they may be extremely essential. At best, the dentist will get only an abstract or summary of what the patient feels. Realizing this, the dentist must compensate for such omissions by gathering as much information as possible, and by never, under any circumstances, relying on a single datum as a basis for his diagnosis.

On the other hand, not everything the patient communicates to the dentist can be regarded as data. A part of it will always be noise. The dentist must learn to disregard or discount some of the patient's statements as well as to allow for the gaps caused by the patient's omissions. The occasional crackle heard from the record player could not come from a symphony; it must be introduced as an artifact by the reproducing system. Analogously, some of the symptoms reported by patients are not congruent with what the dentist knows about anatomy and physiology and must be regarded as "noise" introduced by the patient. To correct for this, the dentist will do well to become familiar with the literature on hysterical or "functional" disorders and symptoms.[1, 4, 5]

At the outset of the dentist's contact with a patient, he knows little or nothing

5. Weiss, Edward, and English, O. Spurgeon. Psychosomatic medicine: clinical application of psychopathology to general medical problems. Philadelphia, W. B. Saunders Co., 1949, p. 81.

about the patient's individual tendency to distort. Each bit of information he obtains, however, when viewed against the background of what he already has learned about the patient, increases his ability to introduce a compensation for the patient's tendencies to distort. Consequently, each succeeding datum should be more capable of compensation and therefore more reliable.

The dentist constantly must remain aware of his own contributions to the communication process, and attempt to allow for the distortions which his own reactions and behavior have introduced. At the same time, once he has begun to know the patient he may be able to use this phenomenon of feedback as a corrective factor, giving more emphasis to things which the patient tends to minimize and paying less attention when it is felt that the patient is exaggerating. Some patients seem to want to argue with the dentist. If the dentist obliges, the point under discussion will be greatly overemphasized. If, on the other hand, the dentist blandly refuses to argue or appears to accept the patient's point of view, the emphasis will be considerably less.

Other patients are unwilling to oppose an authority figure, and are basically trying to please the dentist. They will talk long and loudly about anything which they imagine to be of interest to the dentist and are prone to say what they think he wants them to say. In these instances, any disproportionate show of interest will result in a great deal of overemphasis.

SUMMARY

The data on which the dentist bases his diagnoses are, to a large extent, subjective. They can never be regarded as complete or as entirely free from distortion resulting from the influence of personality factors and emotional conflicts. Some understanding of psychological mechanisms is a valuable aid in the diagnosis and treatment of obscure pain. An analysis of the process of communication in terms of an electronic analogue can provide the dentist with a scheme for increasing the reliability of his diagnostic data. This suggests that:

1. The dentist should expect his information to be incomplete, distorted and embellished with "noise."

2. He should attempt to insert a compensating factor derived from his accumulating understanding of the patient.

3. The dentist should be aware of the existence of "feedback," guarding against its undesirable distorting influence and consciously attempting to utilize it as a corrective factor.

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Source of Supply • Behind all your practical applications, there is a region of intellectual action to which practical men have rarely contributed, but from which they draw all their supplies. Cut them off from this region, and they become eventually helpless. *John Tyndall, "Lectures on Light."*

New method of block anesthesia of the buccal, lingual and inferior alveolar nerves with single puncture in a straight line

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Sicher[1] has indicated that the occlusal plane of the upper molar is an ideal point to anesthetize the buccal, or buccinator, nerve. He also states that, as this plane is somewhat above the mandibular plane of block anesthesia, it would be inadvisable to attempt a simultaneous block anesthesia of the buccal, lingual and inferior alveolar nerves.

Sicher's observation regarding the point of anesthesia was shown subsequently to be correct, but it has been proved definitely after two and a half years of clinical research that block anesthesia of the buccal, lingual and inferior alveolar nerves has been obtained successfully in more than 500 cases by applying the straight line method with only one puncture.

In order to obtain a constructive basis for this technic of block anesthesia, it was necessary to make an anatomic study which was followed by a clinical survey.

In Figure 1, the position of the buccal, lingual and inferior alveolar nerves can be seen clearly. These nerves are reached in the region of the infratemporal fossa.

The buccal nerve is situated in the anterior section of the fossa, being separated from the mouth by a slight cover of connective tissues, buccinator muscle and the buccal mucosa. The lingual and inferior alveolar nerves are located behind the buccal nerve in the infratemporal fossa.

It can be noted that the buccal, lingual and inferior alveolar nerves course in an anterior and posterior line which is almost at the same level and direction in which this technic is developed in order to obtain a satisfactory block anesthesia of these nerves.

In order to make an anatomic study, it was necessary to obtain an anatomic section, which is illustrated in Figure 2. It was acquired in the following manner: The mouth of the cadaver was placed in an open position (before stiffness set in), in a manner whereby the occlusal plane of the lower teeth was parallel with the horizontal plane. This position thereby places the mouth on a plane equal to that which is used to make an inferior block anesthesia. A wooden block between the teeth maintained this position, and the area was

This paper is part of a thesis, Faculty of Dentistry, São Paulo University, São Paulo, Brazil.

Odontologic assistant, Faculty of Public Health and Hygiene, University of São Paulo.

1. Sicher, H. Oral Anatomy. St. Louis, The C. V. Mosby Co., 1949, p. 425.

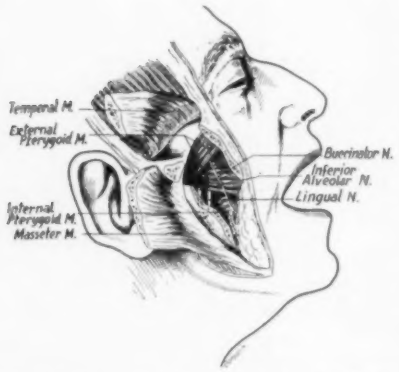

Fig. 1 • Position of buccal, lingual and inferior alveolar nerves

frozen. A tranversal cut was made following the line of the commissure of the lips.

This transversal cut thereby corresponds in a vertical sense to the point of penetration of the needle.

The section shown in Figure 3 was obtained in a manner like that described previously, except that the head had become rigid, and it was impossible to open the mouth.

It can be seen readily that owing to the fact that the mouth could not be opened, the transversal cut was made slightly above the normal position whereby the external pterygoid muscle was reached.

In Figure 3, it can be observed that the lingual and alveolar nerves that should be in the outer part of the internal pterygoid muscle are seen in the inner surface of the external pterygoid muscle.

TECHNIC

Special care must be taken to see that the head of the patient is in a firm and secure position so that the occlusal plane of the lower teeth is parallel to the horizontal plane. The point of the puncture of the needle in this technic is obtained in the following manner:

The caudal-cranial distance, from the lower point of the retromolar fossa, is measured at an average of 21 to 24 mm.

The lateral-medial distance, pertaining to the inner surface of the ramus, is measured 6 to 9 mm.

The dorsal-ventral distance, pertaining to the anterior edge of the ramus, is measured 2 to 4 mm.

This point of penetration of the needle corresponds to the superior third of the pterygotemporal depression.

In order to facilitate the execution of this technic, it is advisable to use a Luer syringe of 3 cc. This syringe, being thinner than the common types, has proved satisfactory.

A needle of 25 gauge caliber, 1¾ inches in length, is recommended. Naturally, it is understood that the full length does not penetrate the tissues. The above mentioned length is recommended because it would be easier for the operator to withdraw the needle if it should break during the injection.

The cheek is stretched laterally far away from the point of puncture, so that

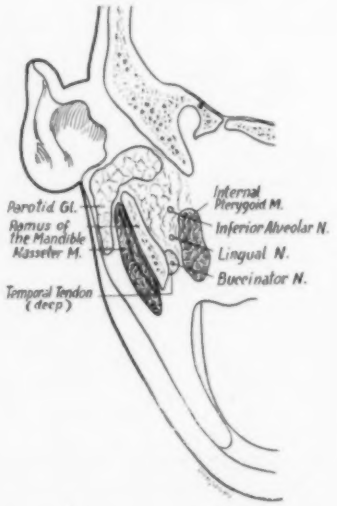

Fig. 2 • Transversal cut (adult)

it can be observed clearly. The region is cleaned thoroughly with an antiseptic where the puncture is to be made, and the needle is introduced in such a manner that the body of the syringe corresponds vertically with the commissure of the lips, at the same time corresponding transversally to the posterior portion of the mucobuccal fold, whereby the syringe lies parallel to the sagittal plane.

The point of penetration of the needle can be observed in Figure 4, left. As soon as the needle has penetrated both the mucosa of the mouth and the buccinator muscle it makes contact with the fibers of the temporal muscle. At this stage, 0.9 cc. of anesthetic solution is released in order to anesthetize the buccal nerve, followed by a further penetration of the needle to a depth of 1.5 cm., releasing 0.6 cc. of the anesthetic solution, thereby anesthetizing the lingual nerve. Finally, the depth of the needle is extended for a third time, to 2.5 cm., releasing 1 cc. in order to anesthetize the inferior alveolar nerve. The transversal position of the syringe and the mucobuccal fold can be noted in Figure 4, right.

In a block anesthesia of the inferior alveolar nerve (Fig. 5), the tip of the index finger is placed into the retromolar fossa. In the straight line technic it is better to use the following method in order to simplify the execution of the anesthesia: The index finger of the left hand is introduced into the oral cavity, thereby allowing the palmar surface of the index finger to rest in contact with the mucosa of the mouth and the digital tip in contact with the retromolar fossa. The finger in this position becomes a

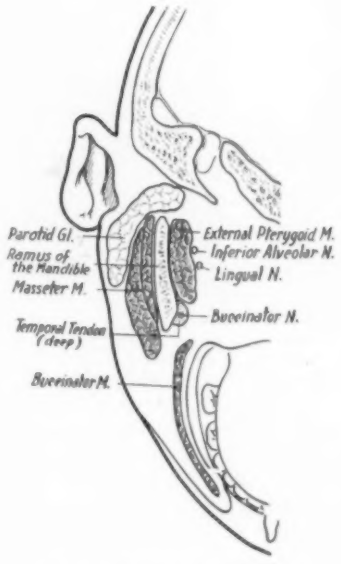

Fig. 3 • Transversal cut (child)

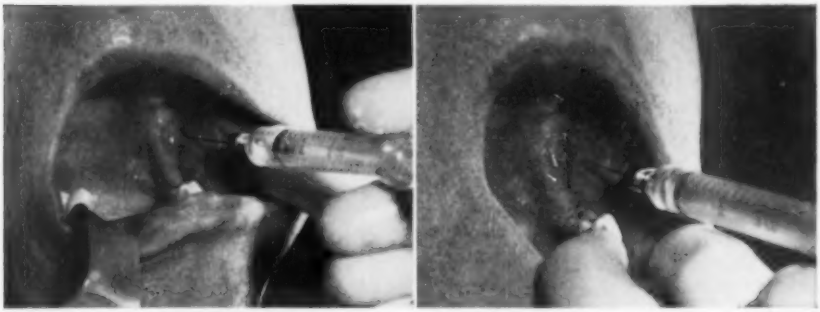

Fig. 4 • Left: Point of penetration of needle. Right: Note transversal position of syringe and mucobuccal fold

Fig. 5 • Note that needle is in line with inferior alveolar nerve

guide or starting point of the initial puncture.

If the injection is being made on the right side of the head, the needle is raised 0.5 cm. from the distal surface of the medial extremity of the index finger, also 0.5 cm. inward and beyond the finger. This is the exact point where the puncture is made (Fig. 6).

If the injection is being made on the left side, the position of the needle is changed from the lateral extremity of the index finger instead of from the medial extremity.

POINTS OF PENETRATION FOR CHILDREN

In order to obtain the exact point of penetration of the needle for children between 12 and 14 years of age, the needle is allowed to rest on the upper surface of the finger, and a puncture is made in a straight line. For children of eight or nine, the syringe is lowered, being allowed to lie between the upper half of the nail and the top surface of the finger (Fig. 7). The recommended position of the syringe for children of five to six years of age is found in the direct center of the nail.

TECHNIC OF BLOCK ANESTHESIA FOR CHILDREN

As soon as the needle has penetrated the mucosa of the mouth and the buccinator muscle, 0.7 cc. of the anesthetic solution is released, in order to anesthetize the buccal nerve, followed by a further penetration of the needle to a depth of 1 cm. Once again 0.4 cc. of the anesthetic is released, thereby anesthetizing the lingual nerve. Finally, the depth of the needle is extended to 2 cm., releasing 0.7 cc. in order to anesthetize the inferior alveolar nerve.

ADVANTAGES OF STRAIGHT LINE TECHNIC

Use of the straight line technic eliminates the necessity for a second puncture when block anesthesia is being administered. There is less nervousness on the part of the patient when the second puncture can be eliminated. It is the duty of every dentist to eliminate as much discomfort as possible for his patients.

The straight line technic does not permit an excessive hand movement. The common procedure of block anesthesia is

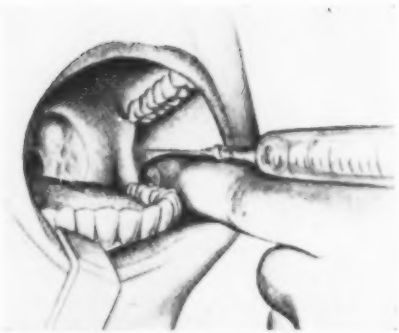

Fig. 6 • Point of penetration of needle for adults

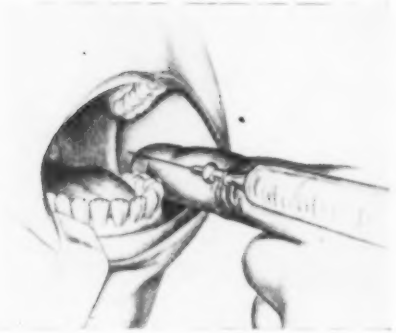

Fig. 7 • Point of penetration of needle for children

to swirl the needle from the initial point of penetration or to apply two punctures; this procedure causes a certain amount of traumatism of the tissues of the mouth. The straight line block anesthesia is not only simple and effective, but it also eliminates some pain from trauma.

SUMMARY

The straight line technic of block anesthesia is indicated to anesthetize the innerved area of the buccal, lingual and alveolar nerves with only one puncture of the needle.

It also facilitates the work of the dentist by eliminating the twist of the needle after the initial penetration. Results have proved most successful with adult patients and excellent with children.

The following points are important:

1. The occlusal plane of the lower teeth must be parallel to the horizontal plane.

2. In a vertical sense the point of penetration of the needle corresponds to the lip commissure.

3. In a transversal sense the body of the syringe corresponds to the posterior portion of the mucobuccal fold.

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Need for Understanding • There is no greater necessity in the world of today than a closer understanding by the politician and the citizen of the motives and methods of science, and by the scientific worker of the inevitability of politics and the responsibilities of citizenship. *Sir Robert Watson-Watt, Bulletin of the Atomic Scientists.*

Anesthesia for the child patient

Norman H. Olsen, D.D.S., M.S.D., Chicago

It is the objective in dentistry for children to accomplish a maximum amount of work in a minimum amount of time with the least degree of discomfort to the patients. To obtain these objectives, there are numerous avenues of approach. The importance of a systematic, positive approach to the procedures at hand cannot be overemphasized, and the dentist should attempt to visualize the results which he anticipates prior to starting.

The cooperation of the child in the dentist's efforts to perform services is of utmost importance. Dentists are not only capable of doing better work in a shorter period of time, but cooperation reduces the dentist's nervous tension to a minimum. There is perhaps no easier way of losing the cooperation of an individual, be he child or adult, than to subject him to pain and discomfort for an extended period of time. It is felt that it is the dentist's obligation to perform his services with the least degree of discomfort of which he is capable. With the advent of the many fine local anesthetic agents which dentistry now has, the dentist is better able to render this type of service.

A question which is raised frequently in discussions of operative procedures for the child patient is whether the deciduous dentition is as sensitive as the permanent dentition, and subsequently whether local anesthesia is required for the deciduous dentition. It is agreed that the deciduous molars are not as a rule as sensitive to operative procedures at the age of eight years as the first permanent molars, but it is felt that this is not a fair means of comparison. The deciduous molars at this age are rapidly nearing the end of their life span whereas the first permanent molar has only recently made its appearance in the dental arch. By the time the patient attains the age of 60, the first permanent molar also is less sensitive having been exposed to the fluids of the oral cavity and the many forms of stimuli to which a tooth is subjected. It may thus be concluded that it is difficult to compare accurately the sensitivity of the two dentitions.

Anesthesia is a great adjunct to dentistry for children. Local anesthesia assists the dentists to perform operative and minor oral surgery procedures in the office with a minimum degree of discomfort to the patients. By the employment of local anesthesia, the often repeated horror stories of dentistry will soon be forgotten by this young generation. General anesthesia allows the dentist to render services in the hospital to the chronically ill and to the very young child who previously was sorely neglected.

Paper presented before the Midwinter Meeting of the Chicago Dental Society, February 7, 1955.

Associate professor and chairman of the department of pedodontics, Northwestern University Dental School.

LOCAL ANESTHESIA

There are certain anatomic considerations and variations that should be included in a discussion of local anesthesia and its use. When administering anesthesia in a child's mandible, there is a slight variation in technic as compared to that of an adult. Initially, the level of the inferior alveolar injection is lower and thus closer to the occlusal plane of the molars since the mandibular foramen is situated at a lower level than the occlusal plane in a child (Fig. 1). Secondly, the total distance from the mucous membrane to the mandibular foramen is approximately half the distance of that of an adult. The mandible of the young child is not as dense or compact in its composition as the adult's mandible and thus infiltration type injections may be employed in the anterior region of the mandible in the young child.

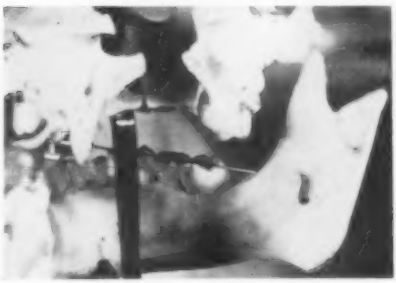

Fig. 1 • Mandibular foramen is at lower level than occlusal plane in young child

Nerve Distribution • The nerve distribution in the maxilla does not seem to be as constant and consistent[1] as that found in the mandible. It was of considerable interest in a study of 26 cadavers to note the variations present in the distribution of nerves in the maxilla. Initially, the number of branches arising from the infraorbital nerve to constitute the anterior superior alveolar nerves varies from one to three in number. Another observation was that the nerves arising from the anterior superior alveolar nerves on the anterior aspect of the maxillary bone show a very startling degree of variation. This variation is from a sparseness of nerve filaments to a very dense, complex configuration of nerves with no apparent definite pattern (Fig. 2, above left).

It was of interest to observe that in over half the specimens (53 per cent) that the middle superior alveolar nerve was absent (Fig. 2, above right). When absent, the superior dental plexus is formed between the anterior and posterior superior alveolar nerves. In instances in which the middle alveolar nerve is present, the plexus is formed between the anterior, middle and posterior superior alveolar nerves. A close proximity of the nasopalatine nerves and filaments arising from the nasopalatine nerve to the apexes of the upper central incisor teeth was also noted (Fig. 2, below left). Phillips[2] reported in his study that he was able to follow an incisive branch, arising from the nasopalatine nerve, into the upper central incisors.

From the preceding observations it can readily be understood why in some instances difficulty in obtaining complete anesthesia might be experienced.

Approach to Patient • In administering local anesthesia to the patient, a positive, direct approach should be made toward the child. It is felt that often dentists have made too big an issue about administering anesthesia and have thus tended to augment any adverse psychological effect. There are very few children even of the preschool age who have not experienced the sensation of having

1. Olsen, N. H.; Teuscher, G. W., and Vehe, K. L. Study of the nerve supply to the upper anterior teeth. J. D. Res. 34:413 June 1955.

2. Phillips, W. H. Anatomic considerations in local anesthesia. J. Oral Surg. 1:112 April 1943.

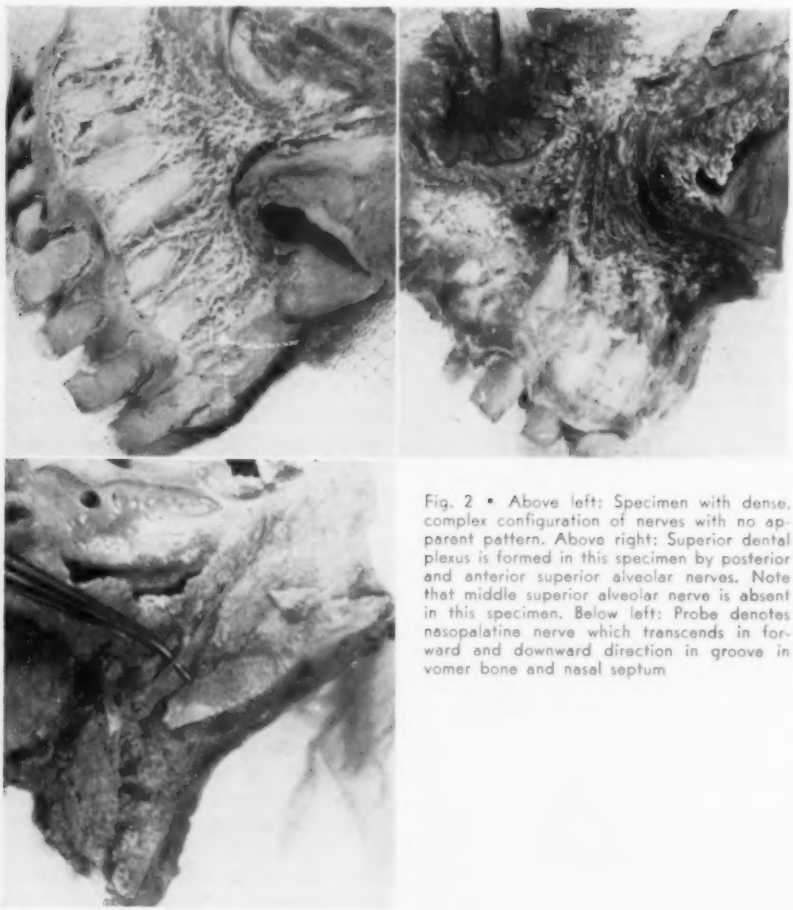

Fig. 2 • Above left: Specimen with dense, complex configuration of nerves with no apparent pattern. Above right: Superior dental plexus is formed in this specimen by posterior and anterior superior alveolar nerves. Note that middle superior alveolar nerve is absent in this specimen. Below left: Probe denotes nasopalatine nerve which transcends in forward and downward direction in groove in vomer bone and nasal septum

an injection of some variety. Bearing this in mind, a dentist would only be fooling himself if he thought he could administer anesthesia unbeknown to his patient.

It is my contention that the administration of the local anesthetic agent should be approached by the dentist in as direct a manner as any other operation undertaken in his office. It is felt that the child should be told that the tooth is going to be "put to sleep." Younger children are often asked if they have ever experienced a mosquito bite during the summer. While the dentist is asking the child, the child is pinched lightly on the hand, and it is explained that this is how it will feel when the tooth is being anesthetized. The child is also told that it is of utmost importance to keep his head absolutely still since it would hurt if the head were moved while placing the solution.

All injections should be made while the dentist is standing in front of the patient.[3] Besides giving the dentist a

more direct approach to the area to be anesthetized, the child will be inclined to focus his attention on the operator's face while the injection is being made. Injections made on the left side are administered with the left hand while those given on the right side are given with the right hand.

After the anesthesia has been administered, the child is told what the symptoms of anesthesia are, and the patient is cautioned not to bite his cheek after the operation has been completed. It is deemed advisable to warn young children's parents to observe that they do not chew their tongue or cheek while it is anesthetized.

Armamentarium • The type of syringe suggested for use on children is the Luer-Lok glass syringe having a 2 cc. capacity. This type syringe is preferred to the more commonly used cartridge syringe for the following reasons: Initially, it permits the dentist to aspirate prior to depositing the anesthetic solution, thus reducing the possibility of a hematoma. Secondly, the Luer-Lok syringe is less conspicuous than the cartridge-type syringe. The needles employed should be of the same size as those used on adults. For a mandibular injection, the needle should be 1½ inches in length, and the one utilized for infiltration in the maxilla should be 1 inch in length.

The type of anesthetic solution to be used is dependent on the preference of the individual operator, as some dentists perfer one to another. It is best, however, to select one that has the approval of the American Dental Association and has been proved not to be toxic to the tissue in which it is deposited.

Technic • Supraperiosteal injections are given for operative and minor oral surgery procedures in the maxilla. When the injection is given, the upper lip is grasped between the index finger and thumb. Then the lip is pulled gently in an upward, outward and downward direction over the stationary needle. There appears to be less discomfort experienced by the patient in administering the anesthesia in this manner than if the needle is forced through the flaccid tissue. The bevel of the needle is directed toward the bone (Fig. 3, left). On contacting the bone, it is withdrawn slightly (1 to 2 mm.) and the anesthetic solution is then deposited slowly. The solution should be deposited slowly or the injected tissue will be distended and the effectiveness of the anesthetic agent will be reduced.

In anesthetizing the deciduous molars or their successors, the bicuspids, the anesthetic solution is deposited in the mucobuccal fold between the two adjacent teeth. This will produce anesthesia of these teeth which receive their innervation from branches of the superior dental plexus or from branches arising from the middle superior alveolar nerve. If it is felt that a pulpotomy will be required on the teeth mentioned, a supraperiosteal injection is made on the palate to anesthetize branches arising from the anterior palatine nerve. It has been observed clinically that pulp amputation is painful if this injection is not given to supplement infiltration in the mucobuccal fold. The injection for the anterior palatine nerve is made at a point midway between the lingual aspect of the tooth and the midline. In this area the tissue is not as tightly adapted to the bone, and it is easier to deposit the anesthetic solution.

To anesthetize the upper incisors and cuspids, it is usually adequate to infiltrate in the area of the apex of the tooth to be anesthetized (Fig. 3, right). In some instances it may be difficult to obtain complete anesthesia of the upper central incisors without giving a nasopalatine injection. This is a rather sensi-

3. Olsen, N. H. Local anesthesia for operative procedures on the pre-school child. New Jersey D. Soc. 24:11 Jan. 1953.

tive injection, and it is suggested that a few drops of anesthetic solution be deposited in the area of the papilla prior to injecting through the foramen of Scarpa into the incisive canal. Phillips has reported the removal of 2,000 vital pulps of upper central incisors by employing the nasopalatine injection.

It should never be necessary to give a posterior superior alveolar nerve injection (zygomatic injection) when performing operative procedures for a preschool child, as the posterior superior alveolar nerve does not innervate any member of the deciduous dentition. However, on the eruption of the permanent molars, it is necessary to give this injection. This is performed by using a long needle and advancing the needle from a point over the mesiobuccal root of the first permanent molars in an upward and inward direction of 45 degrees to the occlusal plane of the teeth and to the lateral aspect of the maxilla. When working on the first permanent molar, it is also essential to anesthetize branches arising from middle superior alveolar nerve or the superior dental plexus.

In anesthetizing the teeth in the mandible for operative procedures, the inferior alveolar nerve is blocked prior to its entrance in the mandibular canal. The injection on the left side is done with the left hand and on the right with the right hand. This allows the operator to stand in front of the patient, having a more direct view to the area to be anesthetized.

For lower injections, the headrest is adjusted to maintain the mandibular occlusal plane parallel to the floor. The index finger is laid on the occlusal surface of the molars so the radial surface touches the bucco-occlusal angle. The fingernail rests on the internal oblique ridge while the ball of the finger rests in the retromolar fossa. The barrel of the syringe lies on a plane between the two deciduous molars in the opposite side of the arch. With the bevel of the needle directed toward the bone, the injection is made at a lower plane than for an adult since the mandibular foramen is at a lower level[4] in a young child (Fig. 4). If the lingual injection is to be given at the same time, the barrel of the syringe

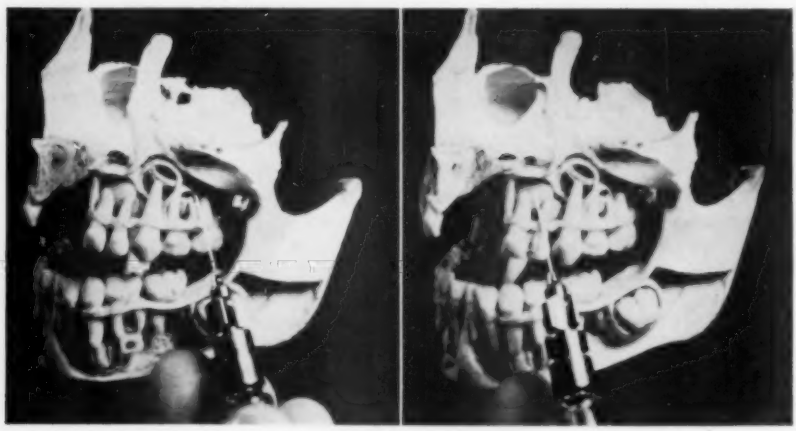

Fig. 3 • Left: Bevel of needle is toward bone. Anesthetic agent is deposited between two deciduous molars when anesthetizing maxillary molars. Right: Anesthetic agent should be deposited in area of apex of maxillary anterior tooth which is to be anesthetized

is brought to the other side and the solution is deposited as the syringe is withdrawn.

It is imperative that the index finger be held in the proper position and place in giving an inferior alveolar injection to direct the operator to deposit the anesthetic solution in the proper area. In case of breakage of a needle it will also enable the removal of the broken needle, which might otherwise be engulfed by the surrounding tissue.

Emergencies • In giving anesthesia, the dentist should always be prepared to meet with any emergency which might arise. Perhaps the best means to prepare for an emergency is not to become excited but approach the problem in as calm, deliberate and efficient manner as possible. Syncope or a general feeling of malaise is probably the most frequent complication encountered in giving an injection. Lowering the position of the patient's head, applying a moistened towel and the administration of aromatic spirits of ammonia is probably the best means of meeting this situation. In the case of a hematoma, it is imperative to advise the patient that no ill effects will be produced and to inform them of the course and duration the hematoma will follow.

GENERAL ANESTHESIA

With the aid of general anesthesia a large group of children which formerly were neglected have had an opportunity to receive adequate dental service. This form of dentistry is not new in that Teuscher and others[5-6] have been performing this service for a period of 10 years or longer. The group of children that might be included in this mode of treatment would be children afflicted with cerebral palsy, epilepsy, rheumatic fever, heart ailments of various types, physically crippled children and the very young child requiring extensive oral rehabilitation.

Fig. 4 • Inferior alveolar injection being given to ten year old child

It is felt that the ideal place to perform this extensive form of treatment with an absence of physical pain and psychic trauma is in a hospital. The average dental office is not designed or equipped to handle the problem adequately. It is important to have a competent anesthesiologist administer the anesthetic[7] as the agent is no safer than the person who undertakes the administration of it.

It will not be possible within the scope of this paper to include all the pertinent information related to this type of service, but it is intended to outline the preoperative preparation and considerations together with an operative technic employed.

4. Lampshire, E. L. Local anesthesia for children. J. New Jersey D. Soc. 18:15 Jan. 1947.

5. Teuscher, G. W. General anesthesia for the pedodontic patient. Northwest. Univ. Bul. 51:15 Jan. 8, 1951.

6. Karp, Mary, and Teuscher, G. W. General anesthesia in the difficult pedodontic patient. J. Pediat. 30:317 March 1947.

7. Album, M. M. Operative dentistry under general anesthesia for difficult patients. J. Den. Children 20:157 4th quart. 1953.

Preliminary Examination • The patient is usually admitted to the hospital the day prior to surgery. This permits the medical staff to appraise the child's general physical condition and to get a laboratory report. A thorough case history[8] is of utmost value as it might disclose pertinent information such as history of convulsions, rheumatic fever, nephritis, blood dyscrasias, brain damage, anoxia and so forth. This information is an invaluable aid to the surgeon and anesthetist in premedicating the patient and performing the surgery. The laboratory report should include a blood and urine analysis. The blood analysis will disclose the percentage of hemoglobin, the red blood cell count, the white blood cell count, and bleeding and clotting time. The urine analysis is important to determine whether albumen or glycogen are present in the urine. The temperature of the patient should also be observed, and it should be noted whether or not the patient has a cold or is asthmatic.

Premedication • With the information from the examinations mentioned, premedication of the child is facilitated. Proper premedication of the patient reduces the amount of anesthetic agent needed and permits the anesthesia to proceed on a smooth plane. In addition to the preceding, premedication reduces mucous secretion, counteracts undesirable side effects and raises the pain threshold.

The child is premedicated approximately an hour prior to surgery with pentobarbital sodium, seconal, atropine or scopolamine and meperidine hydrochloride. The dosage of these drugs is dependent on the child's age, weight, metabolic rate and so forth.

Anesthetic Agent • Tribromoethanol, thiopental sodium and trichloroethylene are a few of the anesthetic agents which have been utilized for this type of surgery. In the selection of an anesthetic agent, the following should be considered. Initially, the agent of choice should be one that maintains a smooth plane of anesthesia with a minimum amount of side effects. Secondly, it should be an agent in which there is no danger of explosion. Trichloroethylene in conjunction with nitrous oxide has proved to be a very suitable agent. The patient can be kept in a light plane of anesthesia during surgery, and will recover consciousness in a relatively short period of time. With trichloroethylene the patient seems to experience a minimum amount of side effects, and the postoperative period is usually uneventful.

Technic • The patient is placed in a supine position for surgery. Ether is then employed by the open drop method to obtain a level of anesthesia so the patient may be intubated. After the patient has been intubated, trichloroethylene and nitrous oxide carry the patient through the operation. If during the course of the operation the plane of anesthesia becomes too light, additional meperidine hydrochloride may be given intravenously to supplement the anesthetic agents.

The mouth is held open with the aid of a mouth prop and the throat is packed with gauze prior to the commencement of operative procedures. The operating table is then elevated to such a height that the operator can work in a comfortable position.

The technic employed permits the preparation of all the cavities in a given quadrant of the mouth at one time. Cavities are prepared in a similar manner as in the office, following the same rules of good operative dentistry. Silver amalgam in the posterior teeth, and the silicate cements and self-curing acrylics in the anterior teeth are the materials of choice for restoring carious teeth. Each quad-

8. Gross, Gilbert. General anesthesia for pedodontics. J. Den. Children 21:25 1st quart. 1954.

rant of the mouth is done in a similar manner.

If any extractions are required, they are performed subsequent to operative procedures. The sockets are packed with a hemostatic agent to minimize postoperative hemorrhage. On completion of restorative procedures, the debris incident to restorative procedures is removed from the oral cavity. Next, the gauze throat packs and nasal tube are removed and any mucus present is aspirated. The patient is then taken to the recovery room where he is under the surveillance of a registered nurse until he regains consciousness. In many instances the patient may be released later the same day if no complications appear.

There is a similarity of complications in adult and children patients, but there is a noticeable difference in rate and time of onset. Insufficient oxygen, hypoxia, is perhaps the greatest danger in employing general anesthesia. The induction period is also more critical in children because of their high nervous irritability and their easily disturbed respiratory activity.

CONCLUSION

Anesthesia, general and local, is a definite adjunct to dentistry for children and helps the dentist to attain his objectives of performing the maximum amount of service in the minimum amount of time with the least incidence of discomfort to the child patient.

Chlorpromazine in the relief of pain after oral surgery

Murray H. Hoffman, D.D.S., M.S., Chicago

In 1950 the diverse pharmacologic activity of chlorpromazine hydrochloride[1] was uncovered by a group of French research workers under the direction of Courvoisier.[2] In their work with animals, the group found that the drug blocked apomorphine-induced vomiting, altered conditioned reflex, slowed gastric motility, lowered blood pressure, and potentiated the action of central nervous system depressants such as anesthetics, sedatives, and narcotics. It was not until the work of Laborit,[3] a French surgeon, became known that chlorpromazine attracted clinical attention. He used the drug as a means of facilitating anesthesia, and later evolved a technic using chlorpromazine and surface cooling to produce artificial hibernation. This resting state, he suggested, stabilized the autonomic nervous system and decreased susceptibility to stress, not only in surgery but in psychic trauma, infectious states, and cranial and other injuries as well. His observations

1. 10-(3-dimethylamino)2-chlorophenothiazine, HCl., supplied for this study as Thorazine by Smith, Kline & French Laboratories, Philadelphia.

2. Courvoisier, S., and others. Pharmacodynamic properties of 3-chloro-10-(3-dimethylaminopropyl)-phenothiazine hydrochloride. Arch. internat. pharmacodyn. 92:305 Jan. 1953.

3. Laborit, H.; Huguenard, P., and Allaume, R. Un nouveau stabilisateur végétatif (LE 4560 RP). Presse med. 60:206 Feb. 13, 1952.

prompted investigators on both sides of the Atlantic to explore further the usefulness of the drug in surgery, psychiatry, internal medicine, obstetrics and other medical fields.

This widespread investigation has resulted in the publication of approximately 3,000 articles in the European and American medical literature. For the most part, however, studies dealing with its application in oral surgery are lacking, despite the fact that evidence exists that the drug potentiates analgesics. For example, Sadove[4] observed that chlorpromazine provided satisfactory relief for severe abdominal, bone and neuritic pain associated with malignant lesions when added to a regimen of narcotics or sedatives which had previously proved ineffective. In addition, he observed that some patients whose degree of pain seemed little affected became relaxed and cheerful, commenting that although their pain was still present they no longer minded it. Wallis,[5] in treating pain due to cancer, severe neuralgias and sciatica, reported that chlorpromazine increased the efficiency of levorphanol, morphine, codeine or salicylates. These observations suggested the usefulness of chlorpromazine in oral surgical procedures, where the majority of surgical wounds present unique postoperative problems.

PHARMACOLOGY OF CHLORPROMAZINE

It is currently believed that chlorpromazine acts principally on the higher neural centers in the general area of the diencephalon or the midbrain.[6] In all probability it selectively inhibits the chemoreceptor trigger zone, the hypothalamus and the reticular substance. These centers are believed to control vomiting, heat regulation, wakefulness, vasomotor tone, muscle tone and secretion of the anterior lobe of the hypophysis. Consequently, inhibition of the activity in this region of the brain influences many psychic and physiologic processes which are integrated with the central and autonomic nervous systems as well as the endocrine system.

The diverse actions of chlorpromazine have been summarized as follows:[6]

1. Ataractic—alleviates anxiety, tension, apprehension and agitation—inducing a state of unique tranquility. Chlorpromazine produces a state of detached serenity without clouding of consciousness or without depression of mental faculties.
2. Potentiator of central nervous system depressants such as anesthetics, narcotics, sedatives and analgesics.
3. Antiemetic.

MATERIAL AND METHOD

Two hundred and eighty-one adult patients, 17 to 61 years of age, who required oral surgical procedures which usually entail the use of large quantities of analgesics or narcotics to control postoperative pain were selected for study. They were divided randomly into a "treated" and a "control" group. The 178 patients in the treated group were given one chlorpromazine tablet (25 mg.) and one APC tablet[7] 30 to 60 minutes preoperatively. The 103 "control" patients received one placebo tablet and two APC tablets also 30 to 60 minutes before surgery.

All 281 patients received a single injection of 600,000 units of repository penicillin[8] intramuscularly, at the time of surgery. These surgical patients were all elective. None were febrile and none showed clinical evidence of concomitant oral cellulitises or upper respiratory infections.

4. Sadove, M. S., and others. Chlorpromazine and narcotics in the management of pain of malignant lesions. J.A.M.A. 155:626 June 12, 1954.

5. Wallis, R. Potentiation of hypnotics and analgesics: clinical experience with chlorpromazine. New York State J. Med. 55:243 Jan. 15, 1955.

6. Thorazine. Reference manual, ed. 1. Philadelphia, Smith, Kline & French Laboratories, Nov. 1955.

7. Each tablet contained aspirin 3.5 grains, phenacetin 2.5 grains, and caffeine 0.5 grain.

8. Abbocillin -DC, penicillin G procaine, 600,000 units in aqueous suspension, and in preservatives of methylparaben and propylparaben. Abbott Laboratories, North Chicago, Ill.

Table • Analgesic demands by oral surgery patients—control (placebo) group and treated (chlorpromazine) group—for five postoperative days

Diagnosis or surgical procedure	No. of patients		Five-day postoperative analgesic demand in grains		Standard deviation for analgesic demand in grains		Patients requiring narcotics additionally	
	Control	Treated	Control	Treated	Control	Treated	Control	Treated
Anterior apicoectomies	31	47	91	14	±34.2	±1.2	0	0
Multiple extractions—4 or more posterior teeth extracted	23	36	121	15	±60.1	±1.7	7	0
Impacted mandibular third molars	27	54	129	19	±63.5	±3.3	9	0
Immediate dentures 6 or more teeth extracted	12	19	108	14	±58.4	±2.5	3	0
Mandibular cystectomy	10	22	106	17	±54.7	±2.7	4	0
Totals and general averages	103	178	111	15.8	±54.18	±2.28	23	0

Five groups were established in accordance with the diagnosis or surgical procedure involved, and are presented graphically in the table and Figures 1-6. The study was conducted using the double-blind technic; that is, neither the patient nor the investigator knew the identity of the medications. To prevent the latter's knowing, the assistant, who served as a neutral observer, dispensed the preoperative and postoperative medication and noted on a chart, which she kept to herself, the name of the patient, the date of surgery, the medication given, and the quantity utilized.

The surgical wounds of all patients in this study were coapted with no. 00000 interrupted nylon sutures. The wounds healed by first intention and the sutures were removed on the fifth postoperative day. The patients were seen on the second and fifth postoperative days.

Home measures for oral hygiene consisted of saline rinses (one teaspoonful of table salt to one quart of water, boiled for five minutes). Each patient was advised to use 8 ounces of this solution every hour during the waking hours for the first two days and after meals thereafter.

Immediately after surgery each patient was given two envelopes. Those in the control group were given two envelopes, one with 10 placebo tablets containing 5 grains milk sugar (lactose), and one containing 20 APC tablets. Those in the treated group were given one envelope containing 10 chlorpromazine tablets (25 mg. each) and one containing 20 APC tablets. The envelopes containing placebo or chlorpromazine were labeled "one tablet, A.M. and P.M."; and those containing APC were labeled, "one or two tablets every three-four hours, if necessary, for pain only. Please return unused tablets. This is very important, for it helps us to evaluate your progress following surgery."

Careful record was kept of the unused analgesic tablets. In addition to the two envelopes, each patient was given a slip of paper which contained the grid and printed instructions shown in Figure 7.

Prior to dismissing the patient, immediately after surgery, the assistant gave

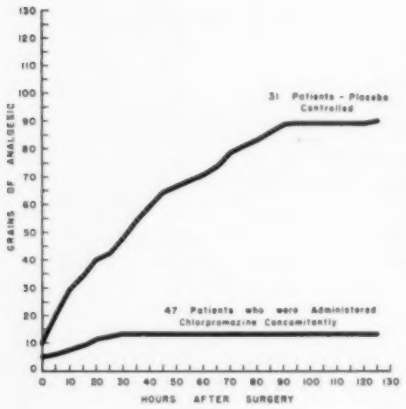
GRAINS OF ANALGESIC
HOURS AFTER SURGERY
31 Patients - Placebo Controlled
47 Patients who were Administered Chlorpromazine Concomitantly

Fig. 1 • Mean amounts of analgesic consumed (total increments) per patient for five days, in 78 patients after apicoectomies

careful instructions on how to fill in the grid.

When the patient returned on the fifth postoperative day, the office assistant transferred the information from the grid to master charts. One chart comprised the chlorpromazine treatment group and the other the placebo group. A double check on the patients' grids was made by counting out the number of returned APC tablets or adding the number of APC tablets which were prescribed over and above the initial ten tablets. In addition, if the patient's record showed that it was necessary to prescribe a narcotic (codeine sulfate) secondarily during the first five days, this information was also added to the master charts after the patient's name.

The final amounts of analgesic taken were computed in grains by giving each tablet a value of 6 grains (3.5 grains aspirin plus 2.5 grains phenacetin). The statistical figures and graphs were evaluated on this basis and are shown as such in the table and in Figure 1 through Figure 6.

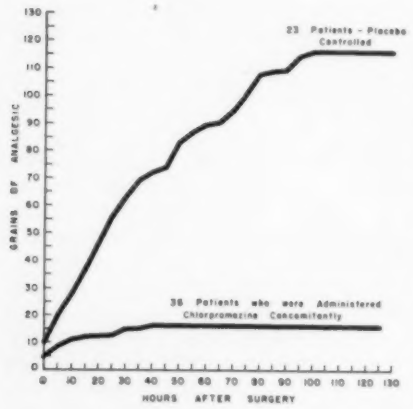
GRAINS OF ANALGESIC
HOURS AFTER SURGERY
23 Patients - Placebo Controlled
36 Patients who were Administered Chlorpromazine Concomitantly

Fig. 2 • Mean amounts of analgesic consumed (total increments) per patient for five days, in 59 patients after multiple extractions

RESULTS

The results, represented in the accompanying table and figures, indicate the analgesic demands, in grains, for five full postoperative days, the first of these being the day of surgery.

The effectiveness of chlorpromazine in this study in reducing analgesic demand and eliminating narcotic demand in oral surgery is also shown in the table and Figures 1-6. The average analgesic demand and standard deviation in demand were significantly lower in the treated group than in the control group (see table). None of the chlorpromazine treated patients required narcotics, but for approximately 22 per cent of the control patients, it was necessary to prescribe codeine.

In the dosages employed, none of the treated patients complained of drowsiness, dizziness, nausea or other side reactions which could have been attributable to chlorpromazine. None of the more serious toxic effects, such as jaundice, agranulocytosis or urticaria, occasionally reported, were observed in this study.

DISCUSSION

The minimal demand for analgesics in the treated group suggests that chlorpromazine eliminates the psychic factors that influence reaction to pain and create a false impression regarding pain threshold. In all procedures in which the drug was administered, the patient stopped taking analgesics by the end of the second postoperative day. This led to the consideration of whether chlorpromazine itself was exerting an anodyne or analgesic effect. From Figures 1-6 it will be noted patients in the treated group were free from pain by the third day, that they usually discontinued all medication, including chlorpromazine, in spite of instructions which advised the taking of this medication—pain or no pain. On the other hand, the control patients invariably finished all the placebo tablets and frequently demanded additional "pain" tablets or required prescription of narcotic tablets, often beyond the third day.

The degree of analgesia produced by APC when potentiated by chlorpromazine was deeper and more prolonged. This observation corroborates that of Sadove[4] and associates and Wallis.[5]

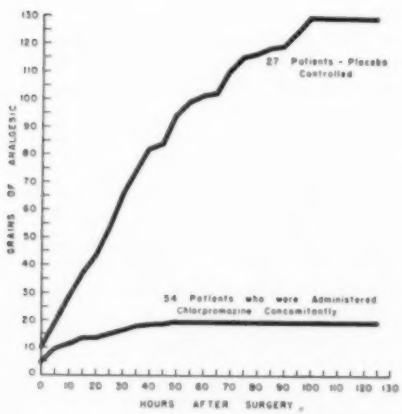
GRAINS OF ANALGESIC
27 Patients - Placebo Controlled
34 Patients who were Administered Chlorpromazine Concomitantly
HOURS AFTER SURGERY

Fig. 3 • Mean amounts of analgesic consumed (total increments) per patient for five days, in 81 patients after surgical removal of impacted mandibular third molars

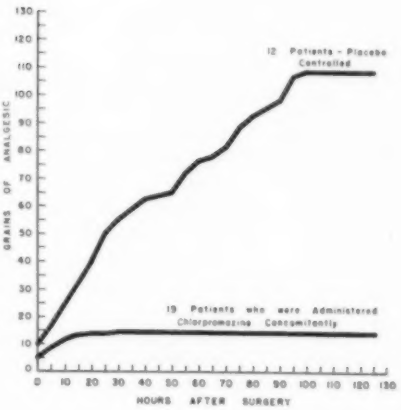
GRAINS OF ANALGESIC
12 Patients - Placebo Controlled
19 Patients who were Administered Chlorpromazine Concomitantly
HOURS AFTER SURGERY

Fig. 4 • Mean amounts of analgesic consumed (total increments) per patient for five days, in 31 patients after surgical removal of 8 to 12 maxillary and mandibular teeth for insertion of immediate dentures

It might be argued that the euphoric patient will avail himself of less analgesics, since he would tend to ignore painful stimuli. Chlorpromazine, however, does not produce a state of euphoria. Kinross-Wright,[9] in discounting chlorpromazine "euphoria," stated,

> . . . the drug produces, at first, an inertia and a feeling of muscular weakness. It is possible, indeed, that there may be an actual diminution of muscle power. It does not induce euphoria, though patients have increased capacity for disregarding unpleasantness, whether this be physical or mental stress.

This observation is consistent with the ataractic or tranquilizing action of chlorpromazine. As noted earlier, the drug produces tranquility without clouding of consciousness.

Standard deviation in the analgesic demand by control patients was extremely high and varied considerably, as opposed to a low and relatively fixed deviation in treated patients. This can hardly be con-

sidered a chance factor in groups of 103 and 178 patients. Deviation in control patients (general average of ± 54.18) indicated wide variability in response to pain; deviation in treated patients (general average of ± 2.28) indicated a noticeable regularity in response. In the control group, response to pain was so exaggerated that it became necessary to administer narcotic (codeine sulfate) to 23 patients (22 per cent), whereas, in the treated group not a single patient required a narcotic.

It was also interesting to note that edema and trismus, which are common sequelae in oral surgical procedures, were considerably reduced in the treated patients. It is possible that the stabilizing action of the drug on the autonomic nervous system was intrumental in preventing edema and trismus and thus helped to prevent pain resulting from these factors. The combined action on the central and autonomic systems suggests the dual role of chlorpromazine in alleviating pain and decreasing the analgesic demand. The latter effect, as borne out in this study, is probably accomplished by the maintenance of a normal or standard pain threshold and the elimination of the psychic factors which govern human response to pain—a variable for which there is no standard of total drug estimation. In this connection, it was most gratifying to note the close superpositioning of the graphic curves which designate the analgesic demand in the varied operative groups in which the patients were treated with chloropromazine (Fig. 1-6).

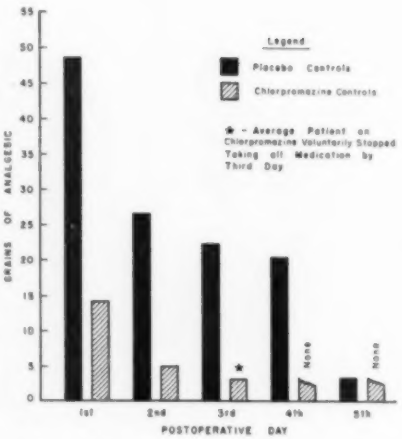

Fig. 6 • Comparison of mean daily amounts of analgesic per patient for five days, in 281 oral surgery patients

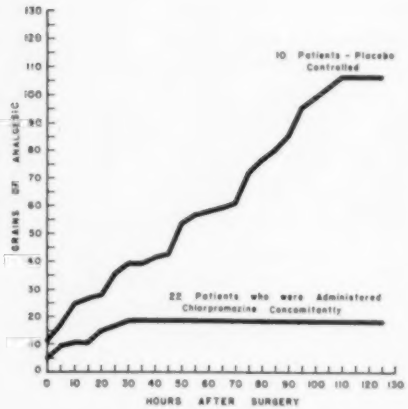
10 Patients - Placebo Controlled
22 Patients who were Administered Chlorpromazine Concomitantly
GRAINS OF ANALGESIC
HOURS AFTER SURGERY

Fig. 5 • Mean amounts of analgesic consumed (total increments) per patient for five days, in 32 patients after mandibular cystectomies

The reduction of edema and trismus when chlorpromazine is used bears further investigation. The observations strongly suggest a similarity in this type of action to that seen in the recent studies made with the antihistaminics,[10,11] repository tubocurarine,[12] and with me-

9. Kinross-Wright, Vernon. Intensive chlorpromazine treatment of schizophrenia. Psychiat. Research Rep., Am. Psychiat. Assoc. 1:53 July 1955.

10. Silverman, R. E. Use of antihistamines in oral surgery: a preliminary report. J. Oral Surg. 11:231 July 1953.

11. Maslansky, M. M., and Maslansky, L. Injectable antihistamines, an aid in oral surgery. New York D.J. 19:274 June-July 1953.

Patient:													Date of Surgery:																							
Day	1st						2nd						3rd						4th						5th											
Time	8	12	4	8	12	4	8	12	4	8	12	4	8	12	4	8	12	4	8	12	4	8	12	4	8	12	4	8	12	4	8	12	4	8	12	4
No. of Tablets																																				

(Please make note of the number of "Pain" tablets taken under the square closest to the time at which taken. Please return this chart.)

Figure 7

phenesin[13] in the prevention of postoperative sequelae in oral surgery. Postoperative antihistamine-like effects of chlorpromazine have been reported recently in general and orthopedic surgery.[14] Laboratory studies on rats by Benditt and Rowley[15] demonstrated antagonism of chlorpromazine to 5-hydroxytryptamine and histamine. The latter two agents are known to be capable of producing hyperemia and edema when injected subcutaneously into rats.

Any postoperative superposed infection was presumably controlled by the penicillin injection in the patients treated with the chlorpromazine and with the placebo. Consequently, the pain noted in this study was considered to be arising from the responses to trauma, spasm, and injury to nerve endings, plus the inflammatory process producing edema and hyperemia at the site of the wound itself.

The suggested establishment of a uniform threshold of pain, the decreased demand of patients for analgesics and particularly the low standard deviation in analgesic demand promise certain real benefits from chlorpromazine to the patients and the surgeon, and to the latter's staff as well. The surgeon may be able to predict the extent and approximate schedule of pain with increased accuracy and to offer the patient assurance of relative freedom from pain. Disruptive postoperative contact between patient and surgeon is greatly reduced and, where necessary, might be handled with much greater predictability by the surgeon. The use of chlorpromazine in managing postoperative pain also offers the psychological advantage to the patient of decreased concern with medication schedules and his condition in general. The routines of practice and office may be simplified for the surgeon and his assistants.

Daugherty[16] drew on American, Canadian and British reports to estimate the incidence of jaundice associated with chlorpromazine therapy. Though jaundice was found in .8 per cent to 1.4 per cent of all patients who received moderate to high doses of chlorpromazine for prolonged periods, there was no jaundice in those patients who received low to relatively high doses for only one to five days. Our observations over the five day therapeutic period in this study coincide with those of Daugherty.

As with any other chemotherapeutic agent, however, extreme care should be exercised in administration of dosage and there should be close observation of

12. Hoffman, M. M. Control of spasm, swelling and pain with repository tubocurarine after removal of impacted third molars. J.A.D.A. 51:547 Nov. 1955.

13. Hoffman, M. M. Role of mephenesin in reducing postoperative sequelae in oral surgery. Study in progress.

14. Martin, E. M., and others. Preliminary clinical report on Largactil (chlorpromazine). Bull. Acad. Med., Toronto 27:9 June 1954.

15. Benditt, E. P., and Rowley, D. A. Antagonism of 5-hydroxytryptamine by chlorpromazine. Science 123:24 Jan. 6, 1956.

16. Chlorpromazine and mental health. Proceedings, Smith, Kline & French Laboratories. Philadelphia, Lea & Febiger, 1955, p. 195-198.

sequelae which may arise over a prolonged period of therapy. Lomas[17] and Hodges and LaZerte[18] reported on single instances of agranulocytosis subsequent to prolonged chlorpromazine therapy. Isolated cases of urticaria and other dermatologic reactions have been reported, in spite of the extensive use of chlorpromazine in the control of status asthmaticus, itching and other allergic or dermatologic diseases.[19-22]

From this investigation it appears that chlorpromazine is adaptable to the postoperative pain problem in oral surgery as in other surgical procedures. Because of the unavoidably induced trauma associated with oral surgical procedures, however, the resultant postoperative pain is, in the concensus of oral surgeons, a greater problem frequently than it is in many other surgical procedures. In addition to the induced trauma, the oral surgeon faces the virtual impossibility of immobilizing or placing a pressure dressing on the average wound. In other surgery, the latter procedures are considered basic and tantamount to good healing and reduction of pain.

SUMMARY

1. Conservative dosage of chlorpromazine in 178 patients who underwent varied oral surgical procedures caused a noticeable decrease in the analgesic and narcotic demand when compared with that of 103 patients who received placebos.

2. When employed according to recommended dosage and in accordance with indications, the drug appeared to be a safe, as well as an effective, agent.

3. Statistical evaluation and graphic visualization of the observations strongly suggest that chlorpromazine is effective in establishing a uniform threshold for pain in the average patient by eliminating the psychic response to pain without requiring narcosis.

4. The drug appears to stabilize response to pain. This may enable the patient, surgeon, and staff to deal more assuredly and efficiently with the variables of postoperative days.

5. No untoward side effects or toxic reactions were encountered from the administration of chlorpromazine in the dosage employed in this series.

6. Further study is needed to investigate the effect which the drug has in reducing edema and trismus—common postoperative sequelae in oral surgery.

2010 West Irving Park Road

17. Lomas, J. Chlorpromazine and agranulocytosis. Brit. M.J. no. 4883:358 Aug. 7, 1954.

18. Hodges, H. H., and LaZerte, G. D. Jaundice and agranulocytosis with fatality following chlorpromazine therapy. J.A.M.A. 158:114 May 14, 1955.

19. Robinson, K. C., and Zuck, D. Chlorpromazine in status asthmaticus. Lancet 2:1349 June 26, 1954.

20. Ende, M. Chlorpromazine hydrochloride in treatment of asthma. Am. Practitioner 6:710 May 1955.

21. Broglie, M.; Jörgensen, G., and Voss, G. Über die neuroganglioplegische Behandlung innerer Krankheiten mit Phenothiazin derivaten unter besonderer Berüchsichtigung des Asthma bronchiale. Ärztl. Wschr. 8:1148 Nov. 27, 1953.

22. Tilley, R. F., and Barry, H., Jr. Chlorpromazine treatment for relief of itching in severe refractory neurodermatitis. New England J. Med. 252:229 Feb. 10, 1955.

Survival of Modern Man • Short-term survival may depend on the knowledge of nuclear physicists and the performance of supersonic aircraft, but long-term survival depends alone on the character of man. *Charles A. Lindbergh, No Other Road to Freedom.*

A method to reduce pain during cementation of restorations

Ralph W. Ludwick, Jr., D.D.S., and L. M. Lynn, D.D.S., Lincoln, Neb.*

For the dental patient, cementation is frequently the most painful part of the whole sequence of operative procedures involving gold restorations. Block anesthesia is often resorted to, but this procedure may be another difficult ordeal for the patient to endure. The setting of the cement may be painful and irritating, and teeth may remain extremely sensitive to trauma and to cold for long periods of time. Many patients know this through previous experience and do not take lightly the prospect of getting used to a new inlay or bridge. As a general rule, the teeth will eventually adjust themselves and become comfortable when subjected to a cold stimulus.

A technic for "conditioning" teeth was developed and has been used continuously for over three years to reduce the pain during the cementation of gold restorations. Other dentists were invited to try this technic and their results attest to the value of this procedure.

MATERIALS AND METHODS

The tooth is prepared for a gold restoration and a casting is constructed. The gold restoration is adjusted for occlusion, contacts and contour in the routine manner. During this fitting process, a careful explanation is given the patient as to how to proceed in conditioning his tooth to reduce pain. While the restoration is out of the mouth, the patient is given a glass of tap water, 60 to 65°F. in temperature, and is instructed to begin rinsing his mouth with a small amount of water, and to increase gradually the amount of water in the subsequent rinsings as the tooth adjusts to this temperature. Rinsing is continued until the patient can tolerate the 65°F. temperature water on the tooth without discomfort. It usually takes about two minutes for the patient to condition his tooth to this temperature. The cold water rinsing cleans the tooth effectively as it is an excellent solvent for both blood and saliva.

As soon as the tooth is conditioned, the operator isolates the area with gauze and cotton rolls. A cotton pellet is moistened in a dappen dish containing approximately 4 cc. of 3 per cent hydrogen peroxide U.S.P. This solution is applied to the prepared tooth. A large loose piece of cotton is placed in the prepared cavity, or around the tooth in the case of a crown preparation. Unwarmed air is used to drive the moisture away from the tooth as much as possible and at the same time care is taken not to direct the air specifically on the tooth. The rest of the

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drying is done with small cotton pellets. If air is used against the tooth at all, it is used carefully after the tooth is almost completely dry to insure reaching the inaccessible parts of the cavity or to dry the gingival crevice (an area cotton pellets cannot contact readily). Care is taken to have the cavity dry without desiccating dentin.

Because the prepared tooth must not be given time to regain its normal body temperature, it is essential that the dental assistant have the cement mixture ready at the same time the operator has his precementation procedures completed.

The restoration is covered with cement and seated. Sometimes parts of the cavity are covered with cement also. Appropriate tapping with a mallet and blunt instrument facilitates the seating and helps to minimize the film thickness of the cement. The patient bites on a match stick to hold the restoration firm during the setting of the cement. After five minutes the match stick and cotton rolls are removed and the excess cement is chipped away.

RESULTS

The pain often experienced during and after cementation has been greatly reduced by this method. In one study the results obtained clearly indicated that the described technic noticeably reduced the pain during the cementation process, and that there were very few teeth sensitive to cold stimuli after the placement of the gold restoration. This information was compiled from the observations made of over 100 patients who had had considerable experience with a number of gold restorations placed in their mouths. This group included dentists, physicians and others who were well aware of their past discomforts after the cementing of a restoration. In many instances the patients remarked on the reduction in pain at the time of the cementation.

The technic has been used at the College of Dentistry, University of Nebraska. A questionnaire was distributed to the dental students who were asked their opinion of patients' pain during cementation. The opinion of the students of the pain experienced by 100 patients was that it was negligible in 91 patients, moderate in 4, and severe in 5.

When the restorations were approved at a later date by the dental school instructor, the patients were interrogated. The following are the questions asked and the answers received:

1. When you were chilling the tooth, how much pain did you experience? Extreme, 5; slight, 62, and none, 33.

2. If there was pain while the cement was setting, was the pain extreme, slight or was there none? Extreme, 5; slight, 30; none, 65.

3. Would you prefer to have Novocain for the same procedure? No, 92; yes, 8.

4. Is this work comfortable to hot and cold fluids? No, 14; yes, 86.

DISCUSSION

Nelsen, Wolcott, and Paffenbarger[1] recorded temperature changes of 43°C. in Class III restorations in which a thermocouple had been placed. Patients drank measured amounts of iced water at 4°C. and hot coffee at 60°C., and they found the temperature of the restorations measured rapidly approximated the temperature of the beverage consumed. This experiment demonstrates the effectiveness of rinsing water for the conditioning of a tooth to temperatures. The use of 65°F. water for a period of two or more minutes will serve to keep the tooth at room temperature or slightly below that level during cementation. Everything in the procedure takes place in near temperature harmony; the gold

1. Nelsen, R. J.; Wolcott, R. B., and Paffenbarger, G. C. Fluid exchange at the margins of dental restorations. J.A.D.A. 44:291 March 1952.

restoration is room temperature, the cement is mixed on a chilled or room temperature slab, and all other medicaments and materials are used without altering their temperatures.

Teeth can stand wide temperature changes, but a rapid change causes pain. Removing enamel and dentin during cavity preparation results in loss of insulation and causes a prepared tooth to be more sensitive even to slight changes. Pain can be tolerated if the prepared tooth is cooled gradually.

The procedure which begins with a tooth at mouth temperature has several disadvantages. Usually the drying process involves moisture evaporation and an air current. The resultant pain may be excessive and occurs while the dentist is operating. This pain, which neither the dentist nor the patient can control, can be compared with the experience of a swimmer who, even on a hot day, will be very cold when he gets out of the water and into an air current but will be comfortable as soon as he is dry and the moisture has evaporated. The warming of medicaments and air blast is ineffective and wholly inconsistent with the objective. The air blast is too hot near the nozzle and not perceptibly warm when it is moved away a short distance. Even so, the air causes a rapid chilling, which is a cause of discomfort. Many operators apply their medications after the tooth is dry, and many times this causes pain.

Many of the objections listed are eliminated by the room temperature technic. The temperature change, representing the difference in normal tooth temperature and the desired cementing temperature of 65°F., is accomplished gradually and painlessly by the patient. The process can be intermittent, stopped altogether or changed at any time to control pain. There is no anxiety on the part of either dentist or patient. The instrumentation and technic of cementation is very simple and fast. No extra skill is required in managing any of the materials used. The tooth is cooled in one operation, it is dried only once, and there is no alternate wetting and drying. Preparations may be cleaned by pumicing before the precementation procedures. The peroxide is used at the beginning while the tooth is wet and nothing is applied after the tooth is dry.

The conditioned tooth stands moisture evaporation and exposure to air much better than before. Also the chilled tooth will stand the heat generated by the cement setting much better than normally. Many times patients complain during the period the cement is setting and then gradually feel better in a few minutes. This period is virtually eliminated when the cold technic is used.

Another important point, undoubtedly associated with pain control, is that the tooth is dried by cotton pellets and is not desiccated by a warm air blast. The tissue fluid of the dentin comes in direct contact with the cement. A heavy mix of cement will reduce the amount of free acid present. Souder and Paffenbarger[2] have made these observations concerning cement in contact with water:

> Minute traces of moisture in a cavity should have no serious effects upon a zinc phosphate or silicate cement. Extreme desiccation of a cavity may cause more injury than could be caused by a trace of moisture left in it. The changes caused by a trace of water abstracted from a cavity will be confined to a thin bottom layer of cement and will be covered with additional layers of normal cement. The effects of moisture at the surface layer of cement, prior to complete set is, however, a serious matter. The phosphoric acid of dental cements has the property of giving off water or absorbing water from the surroundings depending upon the concentration of the phosphoric acid in the cement. Plastic cement, in contact with water prior to the completion of the chemical reactions, will not develop a smooth, hard, glossy surface. Claims that any brand of cement will set in contact with water are quite

2. Souder, W., and Paffenbarger, G. C. Physical properties of dental materials. Washington, D. C., Government Printing Office, 1942, p. 105.

true but they should be accepted with the reservations noted above.

Drying the cavity with cotton as described will remove all visible moisture in most instances. Air is sometimes used in moderate amounts. In any event the retentive parts of the cavity—the vertical converging walls—are easily dried because of accessibility. The deep and inaccessible parts of a cavity, where moisture could presumably remain undetected, will be covered with many layers of cement and should not be a serious complication.

The purpose of this discussion is not to review pulp reactions to the various cements, cavity liners and medicaments. In this study the bulk of all the cavities concerned were not treated in any way by medicaments or cavity liners at the time of preparation or cementation. Some cavities required special pulp treatments and they were handled accordingly. It is sufficient to record that the room temperature technic was employed on all types of teeth and under all conditions with exceedingly gratifying postoperative results. The sensitivity to cold fluids, which is the most common complaint in the postoperative period, has been almost eliminated.

Many operators become very adept with the use of a hypodermic syringe and therefore use block anesthesia for the cementation procedure because they feel there is no pain involved in the injection. It is interesting, however, that of the 100 patients asked whether or not they would prefer procaine for the same procedure, 92 answered in the negative.

This type of study does not lend itself to a comparison of an experimental group with a control group. Results are based on the clinical observations and patients' reactions to the new technic. In this respect, the results have surpassed expectations and have been in such accord with others that it is unreasonable to believe that the estimation of the postoperative results has been incorrect.

SUMMARY

Chilling the tooth to 65°F. and proceeding with the cementation procedures at room temperature have reduced the cementation discomforts and the postoperative sensitivity to cold stimuli.

The Art of Listening • Our lives would be longer and richer if we were to spend a greater share of them in the tranquil hush of thoughtful listening. We are a noisy lot; and of what gets said among us, far more goes unheard and unheeded than seems possible. We have yet to learn on a grand scale how to use the wonders of speaking and listening in our own best interests and for the good of all our fellow. It is the finest art still to be mastered by men. *Wendell Johnson, quoted in The Management Review, August 1955.*

Root canal filling: an evaluation and method

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At the present time, that is, within the past twenty years, several different attitudes or theories regarding the function of the root canal filling may be noted. There are clinicians[1-3] who conceive of the filling as having a possible therapeutic effect and, therefore, employ filling substances which provide an antiseptic action, that is, various pastes containing carbolated resin or thymol; or employ the commonly used inert fillings mixed with various antiseptics or antibiotics.[4] Because claim is made that the silver root canal cements widely used today have antibacterial properties, these should be included in this category.

There are other workers who feel that even inert filling materials are capable of producing a therapeutic effect.[5] They deliberately force extrusions of excess inert filling into the periapical space, hoping that a mild irritation will result and stimulate the forces of repair to heal an existing periapical lesion. In this group may be included those who attempt to encapsulate the apexes of all nonvital teeth with excess inert material.[6] This is done on the supposition that all such teeth have infected resorbed cementum at the apex which, unless covered, would permit future reinfection to take place.

The most rational attitude toward the root canal filling appears to be that it should have neither a medicinal nor therapeutic effect, but rather serves merely as an inert mechanical barrier to separate the root canal from the adjoining periapical tissues. Thus, it can prevent an accumulation of tissue fluids in the canal where its stasis and subsequent decomposition may result in a pathologic reaction. This viewpoint has received confirmation in the animal experiments of Coolidge[7] and of Hill.[8] Both found periapical granulomas developing in dogs, even when pulps were removed aseptically and a coronal seal was inserted to maintain the sterility of the canal. The canals were unfilled, and Hill postulated that the appearance of granulomas in such sterile extirpations might be due to an accumulation of serous exudate which, altered by its own enzymes or some other agent, produces a pathologic reaction.

Because dogs' teeth normally have very many accessory foramens, the possibility of such accumulations is very greatly increased. This and other experimental evidence[9] confirm many clinical observa-

Read before the American Association of Endodontists, Chicago, February 1955.

1. Buckley, J. P. Technic of filling the canals of pulpless teeth with dentinoid and lead. J.A.D.A. 18:471 March 1931.

2. Stein, G. Oligodynamic effect of silver; use in root filling. Zschr. Stomatol. 28:1 Jan. 1930.

3. Trebitsch, H. Oligodynamic effect of silver. Zschr. Stomatol. 27:1090 Dec. 1929.

4. Dixon, C. M., Jr., and Rickert, U. G. Histologic verification of results of root canal therapy in experimental animals. J.A.D.A. 25:1781 Nov. 1938.

5. Stewart, H. T. Filling the pulpless tooth. J.A.D.A. 19:1934 Nov. 1932.

6. Rhein, M. L. Cure of acute and chronic alveolar abscess. D. Items Interest 19:688, 1897.

7. Coolidge, E. D. Reaction of dog tissue to drugs used in root canal treatment. J.A.D.A. 19:747 May 1932.

8. Hill, T. J. Experimental dental granulomas in dogs. J.A.D.A. 19:1389 Aug. 1932.

9. Orban, B. The problem of root canal treatment. J.A.D.A. 19:1384 Aug. 1932.

tions that the greater the tendency for fluids to accumulate within the canal, the greater is the necessity for a more perfect sealing of the apical foramen. Many canals remain perfectly dry throughout the period of treatment. Perhaps this may help to explain why so many teeth with imperfectly obturated canals nevertheless have remained apparently free from apical pathosis.

Another aspect of the filling problem is the extent of insertion of filling material towards the apex.[10,11] Blayney,[12] Hatton,[13] Moen,[14] Coolidge[15] and many others have emphasized the great importance of filling the root canal completely to the apex and how infrequently this is accomplished in clinical practice. Both vertical and lateral underfilling were observed with disconcerting frequency (Fig. 1 and 2).

Several studies[16,17] have been reported in which the extent of root filling was correlated with periapical response. The conclusions of these studies indicated that a somewhat better response might be expected with underfilling. However, too much importance may have been attached to the filling itself. No controls were employed in these studies, so that a causal relationship was not properly established.

Fig. 1 • Above: Previously treated lower molar in which both vertical and horizontal underfilling are present. Note large periapical radiolucent area extending around both roots. Below left: View after canals were re-treated and refilled, using silver cones and root canal cement. Lower right: Healing at apex eight months later

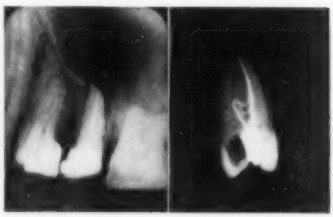

Fig. 2 • Left: Upper bicuspid with canal filling extending to apex. Note periapical radiolucency. Right: Anteroposterior view of extracted tooth showing extent of lateral underfilling

The most widely accepted opinion at the present time is that the filling, in extirpations in vital teeth, should go up to the stump of tissue remaining at the apex. Coolidge[18] believed that the more nearly this is accomplished, the easier it will be for healing and an accompanying calcification of the apex to occur. On the other hand, nonvital teeth should be solidly filled to the foramen. If the filling corks the apical opening tightly, it is performing its function, and no further advantage can be gained by having it protrude into the periapical space.

Clinically, it has been noted that extrusions of excess silver and gutta-percha

10. Grove, C. J. Why root canals should be filled to the denticemental junction. J.A.D.A. 17:293 Feb. 1930.

11. Orban, B. Why root canals should be filled to the dentino-cemental junction. J.A.D.A. 17:1086 June 1930.

12. Blayney, J. R. Fundamentals governing pulp-canal therapy. D. Cosmos 74:635 July 1932.

13. Hatton, E. H.; Skillen, W. G., and Moen, O. H. Histologic findings in teeth with treated and filled root canals. J.A.D.A. 15:56 Jan. 1928.

14. Moen, O. H. Tissue changes in treated teeth of known history. J.A.D.A. 15:2075 Nov. 1928.

15. Coolidge, E. D. Clinical results in root canal treatment. D. Cosmos 69:1280 Dec. 1927.

16. Blayney, J. R. Tissue reaction in the apical region to known types of treatment. J. D. Res. 9:221 March 1929.

17. Grove, C. J. Nature's method of making perfect root fillings following pulp removal. D. Cosmos 63:968 Oct. 1921.

18. Coolidge, E. D. Endodontia. Philadelphia, Lea & Febiger, 1950, p. 196-207.

are generally well tolerated (Fig. 3). The literature[19] on tolerance to excess gutta-percha, however, is contradictory. Dixon and Rickert[20] reported that one brand of gutta-percha, employed extensively in endodontics, produced an active inflammation bordering on the purulent stage. These experiments were performed on rabbits. Boulger's[21] studies of the effect of gutta-percha implants on rat tissues yield results which are in contrast. Regardless of the source or previous manipulation of the implants, they were all found to be well tolerated; the only observable reaction was a fibrous capsule surrounding the implant, indicative of the normal reaction to a foreign body.

With improper handling, the attempt to seal tightly the apex often results in extrusions and consequent transitory soreness and irritation. Overfilling, however, does not insure that a truly compact filling at the apex has been obtained. Whether to overfill or underfill, the difficulty of exercising precise, mathematical control is well illustrated by a statement of Callahan,[22] "I know of one root that was filled just to the end. I know, because I had my thumb over it while filling the canal."

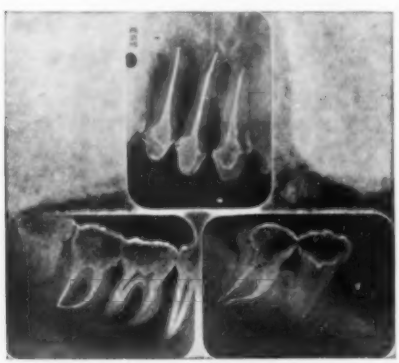

Fig. 3 • Extrusions of gutta-percha and silver. Note how incisor filling (above) had been pushed up en masse during lateral condensation

MATERIALS

Although precise control may appear difficult to attain, a knowledge of the physical properties of the commonly employed materials is helpful in so modifying the use of them as to achieve optimum results. The most frequently employed substance for filling the root canal is gutta-percha.

In a previously published paper, I[23] reviewed the work of W. A. Price[24] and D. C. Miller, who had described exhaustively the physical properties of gutta-percha, chloro-percha and euca-percha. It is obvious that the enormous contraction on setting of either chloro-percha or euca-percha makes the obtaining of a compact apical seal haphazard and rather unlikely. In addition, chloro-percha and euca-percha are extremely difficult to cause to harden, and having achieved this, the materials do not adhere to the walls of the vessel in which they are contained. From this, it was concluded:[23]

> . . . it is evident that the amount of chloro-percha or euca-percha should be absolutely minimal. These function both as a lubricant and surface softener to assist in forcing the gutta percha cone apically for maximum cording action. The softened surface can flow and distort itself more readily and, therefore, can more easily conform to the walls of the canal. . . . No more chloro-percha is required for this purpose than a small amount on the tip of the first properly fitted filling cone.

The findings of Price and Miller were confirmed by D. L. McElroy,[25] who

19. Müller, O. Wurzelfüllungsmethoden. Fortschr. d. Zahnhk. 6:391, 1930.

20. Dixon, C. M., Jr., and Rickert, U. G. Tissue tolerance to foreign materials. J.A.D.A. 20:1458 Aug. 1933.

21. Boulger, E. P. The foreign body reaction of rat tissue and human tissue to guttapercha. J.A.D.A. 20:1473 Aug. 1933.

22. Callahan, J. R. Multiple apical foramina of tooth roots. J.Nat.D.A. 3:85 March 1916.

23. Seidler, B. Technic and rationale of filling root canals. N.Y.J.Den. 24:376 Nov. 1954.

24. Price, W. A. Report of laboratory investigations on physical properties of root canal filling materials. J.Nat.D.A. 5:1260 Dec. 1918.

25. McElroy, D. L. Physical properties of root canal filling materials. J.A.D.A. 50:433 April 1955.

stressed that they failed to consider the following: "Condensation is important in placing a root canal filling. The material must be placed to the apex under pressure if it is to seal completely the canal." In addition to the failure to seal the apical foramen tightly, porosity of the filling material was regarded by McElroy to be an important cause for poor result, and he attempted to study the porosity of various filling materials. The index of porosity was measured by determining the amount of serum which could be absorbed by various equally moist specimens of filling materials. Gutta-percha and Rickert's sealer were found to be equally moderately porous, having one-third the porosity of Silv-o-dent and chloro-percha. However, no consideration was given to the method of insertion and its possible effect on the density of the filling at the apex.

The antibacterial action of the silver root canal cements has been thought to impart a beneficial effect to the canal seal. But in a limited investigation conducted by the author[23] in the search for a new cement having maximum antibacterial properties, it was found that no inhibition of bacterial growth could be observed with either the various combinations or the controls employed. It was concluded that this seeming lack of antiseptic action of the root canal cements should not discourage their use. As stated previously, the function of the root canal filling is not to inhibit bacterial growth but to seal the canal.

CHOICE OF MATERIALS

The first filling cone should cork at least the apical portion of the canal tightly, preferably with the use of only a minimum of softening or cementing substances to complete the sealing. These latter substances are subject to dimensional and other changes on hardening and, therefore, when present in excessive amounts, may lead to failure. Of the solid materials, gutta-percha has the greater plasticity and, consequently, is capable of engaging a somewhat greater length of the walls of the canal. Unless the dimensions of the rigid silver cone are exactly those of the canal, binding may occur at unpredictable points. It is imperative that silver cones be so fitted that at least the apical end binds tightly in the walls of the canal. With either material, the "cork" should be so tight that subsequent points inserted for lateral filling can neither dislodge nor force the first point any further apically (Fig. 3).

Some conclusions may now be drawn as to which combination of materials is most suitable for filling a canal of a certain shape. The choice is based on the degree of plasticity or flow of a combination in relation to the form of the canal.

The very wide canals are extremely difficult to make round, especially near the apex, and therefore require a filling combination which is capable of distorting itself most easily to conform to the irregular, ovoid shape. The combination of choice in such instances is the highly plastic gutta-percha and chloro-percha.

The narrower canals are more amenable to thorough rounding and consequently may be filled with either silver or gutta-percha cones; the choice depends on the length and diameter of the canal.

The longer canals tend to taper less and are probably filled more easily and more compactly with the less tapering silver cone. Moreover, gutta-percha which is finer than a no. 2 or no. 3 Kerr file may be so flexible as to make the compact obturation of a moderately long canal extremely difficult.

CANAL FORM

The form of the canal and the size and position of its foramen influence the filling operation considerably (Fig. 4). The canals easiest to fill compactly are those which are perfectly round and tapering, and in which the apical foramen is

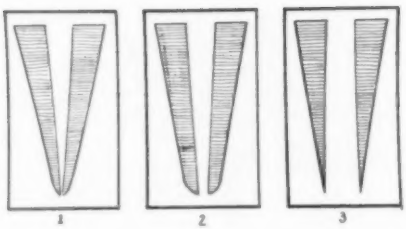

Fig. 4 • Various canal forms. 1: "Ideal" canal, with minute apical opening and perfectly round, smoothly tapering shape. 2: Average canal whose width, taper and apical diameter are variable. 3: Funnel-shaped canal which cannot be filled properly because of greater diameter at apex

minute in size ("ideal canals"). Strong condensing pressure will produce a dense, compact filling without an accompanying extrusion into the periapical space. Other things being equal, because of the minute opening, the tendency for fluids to accumulate in the "ideal" canal will be somewhat less; paradoxically, therefore, the need for such dense obturation of the space will be reduced. Because of this, any preliminary shaping of the canal prior to the filling operation should be directed toward the attainment of this form as closely as possible; widening of the foramen by filling beyond the apex should be avoided (Fig. 5).

On the other extreme are the funnel-shaped canals in which the diameter of the canal at the apex is greater than that toward the pulp chamber. These cannot be filled properly by condensing materials from the pulp chamber end of the tooth. If such teeth are vital, a pulpotomy should be performed first, and the sealed tooth left for several months until the apex becomes more fully formed and favorable for the filling operation (Fig. 6). Nonvital funnel-shaped teeth must be treated with a surgical approach to effect a proper sealing at the apical end.

The average canal ordinarily encountered in practice falls somewhere in between these two extremes; its length, width and apical diameter are variable. Several methods have been advocated previously for the complete obturation of a canal space.

In the sectional method, consideration is given both to the apical diameter and to the length of the canal; by measuring the depth of penetration of various sized condensing pluggers, considerable control may be obtained. However, the technic presents some technical difficulties which, unless mastered, may result in a number of mishaps. This may account for the limited acceptance of the method.

Similarly, the results obtained by lateral condensation may be imperfect. Since it is almost impossible for an additional gutta-percha cone to fill completely a space created by a condensing plugger, a number of voids throughout the filling mass may often result. With either method, the first filling point must really bind tightly at the apex, otherwise any subsequent condensation will force it beyond the apex.

FILLING OPERATION

The depth of penetration of the cone for the first filling, within limits, depends on the thickness of the cone and the apical diameter. The objective, therefore, should be to employ a cone whose apical thickness corresponds to that of the canal.

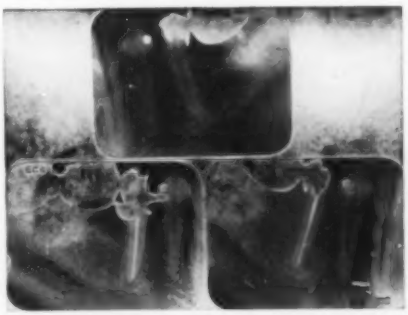

Fig. 5 • "Ideal" canal form

Fig. 6 • Vital lateral upper incisor. Above left: Fracture of crown exposing pulp; apical portion of canal is funnel-shaped. Above right: View four months after pulpotomy, note closure of foramen and some calcification within the canal. Below: Remainder of pulp was removed and canal filled with gutta-percha

The cone then will go up to the apical foramen and bind at that point, regardless of the length or degree of taper of the canal (Fig. 7). Although inaccurate, roentgenograms may be employed for estimating the apical diameter. When a trial cone is being used for this purpose, it may be extremely difficult to determine in a roentgenogram that the cone is binding toward the pulp chamber while fitting very loosely at the apex (Fig. 1, 2, 8 and 9).

A more precise estimation of the apical diameter may be obtained with the paper points used for drying canals. A paper point is cut at its tip end until force is required to cause it to reach just to the apical foramen. Blood or moisture on the point, or sensation, will indicate that the apex has been reached. The paper point should be of minimum taper to insure that binding occurs at its apical end.

The cut paper point is now used as a guide for the selection of the first filling cone. Since differences in thickness can be more accurately perceived in silhouette, the cut paper point and a filling cone are held before a bright surface such as a roentgenogram illuminator and compared. Squinting reduces the overall illumination and yields a sharper silhouette effect. The cone is then cut so that its thickness at the tip closely approximates that of the paper point (Fig. 10). Because of the great lateral compressibility of the paper point, comparable gutta-percha cones will be so wide at their apical end as to result in tight corking of the apex. Although the paper point must be of minimum taper, the gutta-percha cone may be somewhat wider toward the butt end since the plasticity of gutta-percha affords a certain amount of leeway (Fig. 11). After employing this method a few times, it will be found that it is possible to proceed with great security and obtain well condensed root fillings, often without having to resort to check roentgenograms during the entire filling operation.

There are several situations in which the presently available paper points cannot be used to measure the apical diameter. In abnormally long-rooted teeth, such as the cuspids, the paper point may be too short to reach the apex. In these instances, the last file may be used as a

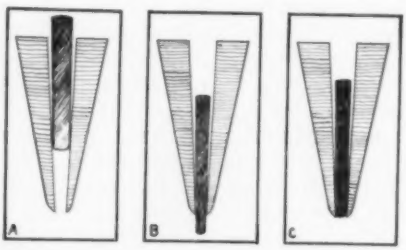

Fig. 7 • Depth of penetration of a point into a tapering space depends on thickness of point in relation to narrowest width of space (apical diameter). A: Overly wide point binds within canal. B: Narrow point extruding beyond apex. C: Point whose thickness corresponds with apical diameter binds at apex

Fig. 8 • Above: Loose fitting silver cone in canal. Buckling of a point within canal indicates loose lateral fit. Area of radiolucency has been increasing since completion of therapy. Lower left: After refilling with gutta-percha and cement. Accessory canals have also been filled. Note how much wider filling is than one above. Lower right: Six months later. Note disappearance of radiolucency

guide if the differences in compressibility between the metal file and gutta-percha are taken into account. A similar guide may be used when the canal is too fine to permit the passage of a paper point to the apex. In contrast, the available paper points may not be sufficiently thick to measure the very wide apexes of immature anterior teeth.

Trial and error may have to be employed in filling such abnormally wide canals, and individually rolled gutta-percha cones have to be fitted (Fig. 12). For this purpose, a strip of baseplate gutta-percha is warmed slightly and rolled into a cylinder. This is then molded to proper thickness and taper by rolling between two warmed glass slabs.

Occasionally, a commercially prepared cone may be reversed and the butt end employed. In one instance (Fig. 13), the butt end of a large cone was softened slightly in hot chloramine-T solution (about 65° C.) and inserted into the canal with some pressure. This yielded a rough impression of the canal, and was used with chloro-percha and other cones to complete the obturation.

When an excessive amount of chloropercha has been used, moderate condensation may result in extrusion of material into the periapical space. If continued pressure on the filling mass will cause further extrusions, it may be better to close the tooth and postpone the final condensation for one or two days. It will then be found that much of the chloroform has evaporated and the filling mass has lost much of its plasticity so that it can be condensed under more favorable conditions.

Since silver cones lack the plasticity of gutta-percha, some modifications of technic are necessary. It is essential that the canal be round, at least at the apical end, to accommodate the rigid, round silver point. Unfortunately, the silver cones manufactured today often lack dimensional uniformity and fail to correspond with the file having a similar number. To obviate this difficulty, greater accuracy

Fig. 9 • Cone for first filling which binds near pulp chamber and fits poorly at apex. Roentgenogram may not reveal similar poor fit of a trial point. Lateral condensation of such a gutta-percha cone will free binding portion and result in gross extrusion beyond apex. If cone is cemented in this position, contraction and porosity of root canal cements may lead to failure

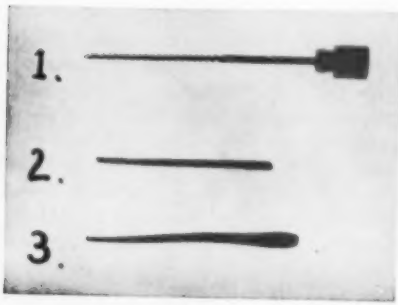

Fig. 10 • Silhouette of 1: Last file used in canal; 2: Paper point cut to go just to apex and 3: Gutta-percha cone fitted to correspond with paper point at its apical end. Note that paper point has minimum taper to insure binding at its apical end rather than butt end. Paper and gutta-percha points are much thicker at their apical end compared with file

will be achieved by employing the silhouette method in selecting the first silver cone. Because of the rigidity of the silver cone, however, comparison should be made with the equally rigid last instrument used in the canal (Fig. 14).

Where the last file was larger than a no. 4 Kerr file and it is felt that the canal accurately conforms in shape with the file, a better apical fit may be secured by beveling and pointing the tip of the silver cone to approximate the point of the file. The butt end of the cone is shortened to end at a level slightly above the floor of the pulp chamber. Grasping of the cone may be facilitated by flattening the butt end in the fulcrum of a pliers.

To insure that the binding occurs at the apical end, the first point, after being seated to the apex, should be removed and thinned from its butt end to 2 to 3 mm. of its tip. If the binding originally occurred at the apical end, a cone so thinned will not be reinserted any further apically. Silver cones may be thinned by grasping the butt end in a hemostat or pliers and working a folded sandpaper disk along its length. To maintain its roundness, the point should be rotated slightly each time the sandpaper is applied. On the other hand, if the first cone is found to go beyond the apex, it should be removed and the excess at the tip cut off rather than withdrawing the point partially and permitting it to lie loosely within the canal. After the first point has been seated with cement, as many additional cones, either gutta-percha or silver, should be inserted into the canal as it will accommodate. Subsequent points effect a lateral obturation where either the canal is still ovoid in shape or its taper is greater than that of the first filling cone. In addition, the amount of cement within the canal will be minimized.

Fig. 11 • A: Fitted first filling cone inserted to point of initial binding. B: Point has been freed from initial bind by spreaders, or forced into position by thick condensing plugger. If taper of point is same as that of canal, initial binding will resemble B

The function of the root canal cement is to complete the filling of any spaces between each of the cones and the walls of the canal. Because of the very tight fit apically of the first gutta-percha cone selected by visual comparison, a plunger piston is created which will drive any cement already in the canal further into the periapical space. When gutta-percha is being employed, preliminary coating of the canal walls is unnecessary and undesirable. Rather, the first point is coated with a thick mix of cement and inserted into the dry canal until it binds tightly.

To seat the filling to the apex, root canal spreaders may be employed to free the point from any binding toward the pulp chamber should this exist. Occasionally, the sectional idea may be utilized. With a thick condensing plugger, pressure is applied to the butt end of the cone, forcing the point to its proper apical seat (Fig. 11). Any spaces still remaining toward the pulp chamber may then be filled with additional cones.

Silver points do not usually produce a plunger piston effect, and preliminary coating of the canal walls with root canal cement is desirable. This may be accomplished with smooth broaches, reamers, or paper or gutta-percha points. All these should go slightly short of the apex and be somewhat narrower than the canal, to avoid a plunger piston effect. Furthermore, the thinner instruments will not remove cement from the walls of the canal leaving bare, uncovered spots. Additional amounts of cement are repeatedly picked up with the instrument and slowly inserted into the canal until it is felt that the inner walls are well coated. Because so much cement may be introduced into wide canals, it should be of slightly thinner consistency in such teeth; a thick, viscous cement behaves as a semisolid, and is more easily driven into the periapical space.

The fitted silver cone is then coated with cement and gently rotated one-quarter turn in each direction while it is slowly brought up into position. When it is felt to be nearly in place, force can then be applied to seat the cone fully.

Since the cement tends to stain and discolor the tooth, it should be completely removed from the pulp chamber after it has hardened. Excess filling materials and cement are removed with burs or spoon excavators using extreme care not to dislodge the silver points. Cotton pellets lightly dipped in chloroform will wipe away any adherent cement particles. After the cleansing, the pulp chamber may be filled with a white cement.

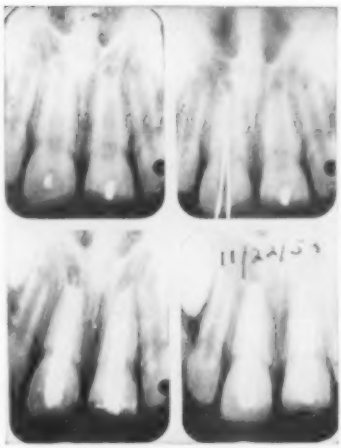

Fig. 12 • Two abnormally wide canals filled with individually rolled gutta-percha cones. Because of ovoid shape of such wide canals, the maximum plasticity required was provided by employing fitted cones in conjunction with chloro-percha. Cones were packed up to stump of tissue remaining at each apex. Note subsequent deposition of cementum at apexes

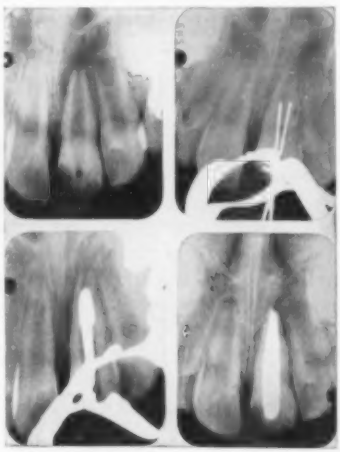

Fig. 13 • Abnormally wide canal in which first filling point was obtained by softening butt end of largest cone available to yield rough impression of canal (below left). This was then inserted, with chloro-percha and other cones, to obturate the canal space completely

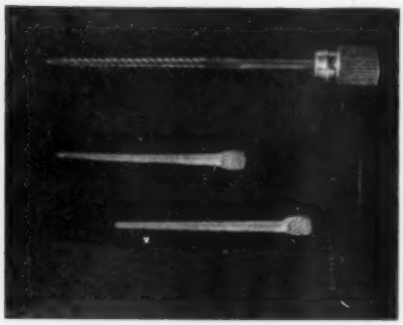

Fig. 14 • File and two silver cones of similar thickness. Middle cone has been tapered at tip to conform with point of file. Butt ends of cones have been flattened in fulcrum of pliers to facilitate handling

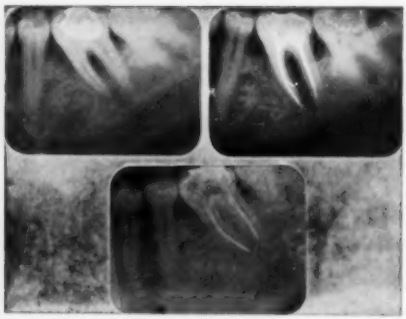

Fig. 15 • Healing of acute, widespread, suppurative inflammation due to necrotic pulpitis. Above left: Periapical breakdown has extended to bone within bifurcation. Above right: Mesial canals were filled with silver cones and cement; distal canals were filled with gutta-percha and cement. Below: Six months later, all bone has regenerated

Multirooted teeth may be filled with gutta-percha in one canal and with silver in the others (Fig. 15). The material components used in each canal is dependent on the shape and size of the canal according to the plan outlined. What materials are employed, however, is far less important than how effectively the apex has been sealed.

SUMMARY

Experimental and clinical evidence seems to indicate that the root canal filling has no function other than to seal tightly the apical end of the root. The filling prevents an accumulation of tissue fluids in the canal where its stasis and subsequent decomposition may result in a pathologic reaction. During treatment, it will be observed that teeth differ in the amount of fluid exuding into the canal. When the flow into the canal is greater, perfection of apical sealing becomes even more imperative. Treatment prior to obturation should sufficiently eliminate periapical inflammation to reduce this source of exudation to a minimum.

The proper choice of material combinations depends largely on the size and shape of the canal to be obturated. Large, ovoid canals require a combination sufficiently plastic to conform easily to irregularities. On the other hand, metallic filling substances are more suitable for the extremely fine and long canals. Methods are described for obtaining good apical corking with the commonly employed filling combinations.

The substances used are far less important than the effectiveness of their sealing action.

57 West Fifty-Seventh Street

Humor • The most valuable sense of humor is the kind that enables a person to see instantly what it isn't safe to laugh at. *Anonymous.*

An improved method for measuring the coefficient of thermal conductivity of dental cement

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One of the real problems in operative dentistry is the protection of the pulp from electrical or thermal shock which may be induced through restorative materials[1] or operative procedures.[2-5] Various methods[6-12] have been used to measure the coefficient of thermal conductivity of poor conductors, but little research has been conducted on dental materials or tooth structure. One publication reported a value for dentin[13] while another investigation[14] measured the conductivity of three commercial zinc phosphate cements. The purpose of this investigation was to develop a more accurate method for measuring the thermal conductivity of dentin, zinc phosphate cement and certain dental materials.

PROCEDURE

The basic apparatus utilized previously for the determination of the coefficient of thermal conductivity (K_t) has been described.[14] This was a modification of the technic used by Lisanti and Zander.[13] Although these data for zinc phosphate cement were felt to give approximate values for this type of material and indicated that it fell into the realm of insulating materials, the experimental method had shortcomings and the conductivity data were not conclusive. One of the difficulties was the maintenance of a constant temperature in the tap water circulating through the cooling coil; thus temperature fluctuations occurred throughout the cold thermode. Because of the high conductivity of the copper, temperature changes in the circulating

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water were readily transferred to the thermode, and a variation in the water temperature prevented the system from remaining static for a given time interval.

Of even greater importance was the difficulty in measuring accurately the temperature differential between the thermocouples placed in the thermode. Unfortunately the differentials were small, often in the range of 0.3° to 0.4°F. These values are most critical in the calculation of K_t and slight experimental error in reading the electromotive force would produce significant error in the final calculated K_t. Various changes were made in an effort to increase these temperature differentials. Higher input temperatures were tried, the type of insulation was altered and ice water was utilized to chill the cold thermode. None of these changes, however, appreciably increased the temperature differential.

It was decided that if the same experimental setup was to be used, and it appeared to be a basically sound method, a different method of calculating K_t might solve the inherent problems that have been discussed. Such a technic eliminates the use of temperature measurements in the thermode itself and thus the critical temperature differentials.

The power input was computed by measuring the voltage and amperage input to the heating element. Voltage was measured by means of an RCA Volt Ohmyst with a scale division of 0.05 volts while the current was determined by a Simpson milliammeter reading to 0.02 ma. Since the power factor angle is approximately zero degrees, the product of the voltage and current equals power (watts). Several of the methods which have been used for measuring thermal conductivity utilize the electrical input as a basis for determining the heat entering the system and then utilize these values in the calculation of K_t.[7, 15, 16] Thus the only other measurements needed are the temperatures of the thermocouples which are embedded in the specimen itself. The magnitude of this temperature differential varied from 8°C. to 35°C. Thus any slight error in the thermocouple reading produces a negligible change in the thermal conductivity constant. The rest of the constants necessary for calculating K_t are physical measurements—the length between the thermocouples and the cross sectional area of the specimen.

Calculation of K_t • The method of calculating the coefficient of thermal conductivity has been described.[14] In this revised method, the heat input in watts was measured by multiplying the volts by the amps. Since one calorie = 4.183 international joules or watt seconds, then Q (watts)/4.183 = Q (in calories). The final formula is then:

$$K_t = \frac{Q(\text{watts}) \cdot m}{4.183(\triangle t) \cdot a}$$

Where K_t = coefficient of thermal conductivity of the unknown

m = distance between the thermocouples in the specimen in centimeters

$\triangle t$ = temperature differential along the specimen in °C. = $(t_1 - t_2)$

a = cross sectional area of specimen in square centimeters

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16. Physics department, Purdue University. Personal communication.

Although this method of measuring thermal conductivity of poor conductors proved to be accurate for the dental materials studied, it was found that there were still certain heat losses present. Five different insulating materials were tried, with samples of known conductivity, but none eliminated this error. Unfortunately these losses are not constant but will vary with different power inputs. This could be expected since as the power input increased, the temperature differential across the specimen increased and the heat loss changed. It was suggested that the problem could probably be solved by determining a loss constant with a specimen of known conductivity.[16]

A Plexiglas specimen was secured.[17] Plexiglas seemed to be the most desirable material to use as a standard since its thermal conductivity falls into the same general range as the dental materials which were to be studied. The ASTM method C-177-45 was used and the constant for the coefficient of thermal conductivity was reported as 3.54×10^{-3} cal. $sec.^{-1}$ cm^{-2} $(°C/cm)^{-1}$. This figure, then, was the known value. By using a specimen of this material in the system, it was possible to establish the deviation at the various power inputs to be used in the subsequent tests.

A specimen was cut from the block of Plexiglas and thermocouples inserted. After stabilization of the system, measurements were taken and the K_t calculated. Ten different power inputs were used with t_1 temperatures ranging from 104°F. to 139°F. (The t_1 temperature is that read from the thermocouple in the specimen which is nearest the hot, or input, thermode.) The specimen was removed and the apparatus allowed to return to room temperature. The same sample was again placed back between the thermodes and the tests repeated. The deviation was slight. The same procedure was followed for a second specimen prepared from the known. Since the true thermal conductivity for this specimen was known, it was possible to establish a constant, called K_j, for each power input.

From these data, a curve for K_j was constructed to be used in the measurements with the unknown materials. The mean factor for four series of tests was plotted against the corresponding power inputs. Thus at any power input the proper constant can be used to correct the values for any error due to heat loss in the system. All K_t values to be presented in the investigation have been calculated using K_j. The method was checked by using a different known glass specimen (obtained from Corning Glass Works, Corning, N. Y., Sample No. 7740) and applying the constant obtained from the Plexiglas standard in the calculation. The mean error was 0.80 per cent.

Materials Tested and Preparation of Specimens • Many materials are advocated for, and may function incidentally as, thermal insulators. It was not possible to measure all of these, and only the most widely used were studied.

Zinc Phosphate Cement • Zinc phosphate cement is the most commonly used material for a base under metallic restorations. It is also the most widely used material for cementation of gold restorations, and thus might serve as an insulator to a limited degree in that capacity.

Previous work[14] had indicated little difference in the thermal conductivity of three commercial brands of zinc phosphate cement. One of these, S. S. White, was used for these tests. It was mixed according to the manufacturer's directions, the powder being weighed by an analytical balance and the liquid measured by a syringe. The thermocouples were placed in the special mold and the material vibrated around the wires. Care was taken to avoid any entrapment of air in the specimen. The

17. Courtesy, Naomi S. Steck, Rohm and Haas Co., Philadelphia, January 19, 1954.

cement was allowed to set for 30 minutes before removal and placement in the apparatus.

Under the conditions of this test, and also in the previous study,[14] the specimen was maintained in a dry condition throughout. The amount of moisture to which cement is exposed in the cavity preparation is not known, but undoubtedly leakage around the marginal areas[18, 19] or moisture present in the dentin itself would prevent complete dehydration of the cement. Since the low thermal conductivity of water itself is known, it would not seem likely that moisture would have the effect which it does on the electrical conductivity of this type of material.[20, 21] It was felt, however, that this variable should be evaluated.

A specimen of S. S. White zinc phosphate cement, same batch as before, was prepared. A plastic tube was constructed to fit around the specimen after its insertion into the apparatus. A glass rod was fitted to the tube, and it extended vertically out of the top of the insulated box. The tube was filled with distilled water; thus the specimen was maintained in a constant moist condition during the test period.

Silicate Cement • A specimen of a representative commercial product of silicate cement, S. S. White, was prepared. The powder was weighed on an analytical balance and the liquid measured by syringe. The mix was completed in one minute and the specimen formed immediately.

Resin Cement • Recently several brands of resin cement have been made available to dentists. These materials are believed to have certain possible clinical advantages for cementation of gold restorations.[22, 23] It has been suggested by some manufacturers that, because of their low thermal conductivity, they might also be especially suitable for cement bases. Since these products are generally a mixture of methyl methacrylate polymer and varying proportions of other filler agents such as silica, zinc oxide and calcium carbonate, the actual thermal conductivity might differ considerably from that of methyl methacrylate or its copolymers.

L. D. Caulk's Grip Resin Cement was selected for the test. Although the exact composition of all the resin cements is not known, it was felt that this particular material was representative. The mix was made according to the manufacturer's directions, and the specimen prepared as previously described.

Zinc Oxide-Eugenol • Zinc oxide-eugenol has long been used for temporary fillings, bases and root canal fillings. The composition of the powder used to prepare the specimen for this study was:

Zinc oxide . . . . . 70.2 per cent
Rosin . . . . . 29.4 per cent
Zinc acetate . . . . . 0.4 per cent

The liquid was 85 per cent eugenol and 15 per cent olive oil.

Gutta-percha • The latex base material, gutta-percha, is used in root canal therapy, as a temporary restorative material and infrequently as a cement base. In view of the known thermal conductivities of various types of rubbers,[24] it would be anticipated that gutta-percha would be

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23. Johnston, J. F.; Phillips, R. W., and Swartz, M. L. A laboratory and clinical investigation of certain resin restorative and cementing materials. II. A twenty-eight month clinical evaluation of a resin cement. J. Pros. Den. 5:705 Sept. 1955.

24. Fowle, F. E. Smithsonian physical tables, ed. 8. Washington, D. C., Smithsonian Institution, 1934.

a good insulator. However, specimens of this material were measured.

Cavity Liners • Numerous cavity liners have been utilized through the years, supposedly as desensitizing agents and to insulate the tooth from the metallic restoration. These materials generally have a shellac base. It was decided to measure two of the most widely used products. The ones selected were Copalite (H. J. Bosworth Co., Chicago) and Replac (L. D. Caulk Co., Milford, Del.).

In this instance the method of determining the thermal conductivity of these materials was altered somewhat for two reasons: (1) difficulty in preparing a solid block of the lining agent, and (2) the desire to study the material when in apposition to a cement, the common clinical practice and one which might influence the thermal conductivity of the material. Two specimens, each one approximately one half the thickness of previous samples and each containing a thermocouple, were prepared from Caulk Grip Resin Cement handled as previously described. A very heavy coating of the cavity liner was then painted on each section. The coated halves were placed together and the specimen inserted into the system.

It must be recognized that the K_t value obtained in this particular test represents that of a combination of the liner and the resin cement and does not indicate the true coefficient of thermal conductivity of the liner itself. However, the values obtained would indicate the effect of the agent in raising or lowering the conductivity of the cement and thus give some indication of its thermal conductivity.

Dentin • Samples of pure dentin, approximately 2.5 mm. cubes, were cut from sound extracted molar teeth. The preparation of these was done under water by means of a slow moving abrasive wheel. To prepare specimens of adequate size for inserting the two thermocouples, it was necessary to cut two cubes and then place the two together to form the final test sample. The preparation of parallel flat surfaces of the two sections was accomplished and a thermocouple inserted in each half. When held under the thermode tension, the apposition of the halves was satisfactory.

Power Inputs Used • A minimum of two different power inputs were run for each specimen. This was done to check measurements although it is common practice merely to cite the temperature used whenever the K_t value is given.[15] The thermal conductivity will vary slightly depending on the input temperature employed, and the National Bureau of Standards tests[25] suggest the use of mean temperatures of 40°, 70° and 100°F.

The power inputs used, and thus the temperature gradient across the specimen, were selected so as to be in the same general range as that to which the material would be subjected in the mouth. In examining the raw data it can be noted that even though the input temperature was always above 100°F., in some instances the t_1 value actually may be less. This is due, of course, to the fact that the thermocouple was placed at some distance from the end of the thermode, and that area of the specimen was being cooled by the cold thermode. This fact is of no significance, however, since it is only the differential that is important. It was always very large. At each power input, the system was allowed to come to complete equilibrium before readings were taken, usually a matter of 12 to 24 hours. Vieweg[26] has shown this to be particularly critical in measurements involving any wet specimen.

25. Robinson, H. E. Agreement of thermal conductivity determinations made by several testing laboratories. Refrig. Eng. 58:988, 1950.

26. Vieweg, R., and Gottwald, F. The thermal values for artificial materials. Chem. Zentr. II:695, 1940.

Table 1 • Typical data showing values for three specimens of zinc phosphate cement that were maintained wet

	No. 1	No. 2	No. 3
E (volts)	16.0	16.2	13.7
I (amps)	0.15	0.15	0.13
P (watts)	2.40	2.43	1.78
t_1 (m.v.)	1.95	2.29	2.75
t_1 (°F.)	67.5	78.0	95.0
t_2 (m.v.)	1.10	1.41	2.12
t_2 (°F.)	38.0	49.0	73.0
△ t (°F.)	29.3	29.3	22.2
△ t (°C.)	16.2	16.2	12.2
K_t	0.000392	0.000392	0.000400

RESULTS

A minimum of four specimens were measured for each material. A typical set of data for three specimens can be seen in Table 1. The K_t values show little difference.

The average K_t values for all specimens of a given material at all power inputs are listed in Table 2.

DISCUSSION

The reproducibility of results obtained at various power inputs and with different specimens of the same material were most satisfactory. The deviations were small, and the system is a good one for studying poor conductors. It is true that human errors are still present, particularly in the preparation and insertion of the test specimen. They can be minimized by development of a standard procedure, however, and by experience in conducting the test. The method certainly is more accurate than the previous procedures used to measure the thermal conductivity of dental structures or materials. It minimizes the necessity of preparing parallel surfaces on the specimen and of measuring temperature differentials which may be small. The determination of a loss constant at the various input temperatures is essential.

The actual coefficient of thermal conductivity value found for dentin differed considerably from those obtained by Lisanti and Zander.[13] They determined the K_t to be 0.002290 cal. $sec.^{-1}$ cm^{-2} $(°C/cm)^{-1}$ while this investigation established it as 0.000257. Although these values are widely divergent, they both lie in a range which would indicate dentin to be a poor conductor of heat and therefore a good insulator to the pulp from temperature changes in the mouth and from heat evolved during cavity preparations or setting reactions of restorative materials. The thermal coefficient constants for other recognized insulators fall into this same general range. For example, asbestos fiber is listed as 1.9×10^{-4} and cork at 7.0×10^{-4}. Naturally, the insulation of the pulp from temperature changes would be dependent on the thickness of dentin remaining, but basically it can be classified as a good thermal insulator.

Table 2 • Mean values for the coefficient of thermal conductivity for the materials tested

Material	K_t (in cal. $sec.^{-1}$ $cm.^{-2}$ $(°C/cm.)^{-1}$
Cavity liner (Copalite) + resin cement	0.000256
Dentin	0.000257
Cavity liner (Replac) + resin cement	0.000259
Zinc phosphate cement (dry)	0.000311
Resin cement	0.000325
Gutta-percha	0.000353
Zinc phosphate cement (wet)	0.000388
Zinc oxide-eugenol	0.000398
Silicate cement	0.000458

The results for gutta-percha compare closely to the value which is quoted.[13] It is listed as 0.00048 while the conductivity in this investigation established it, at least for the particular product tested, at 0.000353. This finding again verifies the accuracy of the system.

The values for zinc phosphate cement differ considerably from previous determinations.[14] This may be attributed to the improved accuracy of the revised method here used. Again it might be pointed out that this is probably of academic interest only, since values in this general range catalogue the material as a poor thermal conductor. It is not surprising to find that water had little effect on the conductivity of zinc phosphate cement. The K_t value of distilled water is listed[24] as 1.36×10^{-3} at a temperature of 25°C. Moisture did raise very slightly the coefficient for zinc phosphate cement in this investigation.

As would be expected, unless the cement is unduly loaded with filler agents, the resin cements are good insulators. It is possible that certain commercial products now on the market which contain filler materials such as aluminum oxide might show considerably higher values. It is apparent that the cavity liners tested reduced slightly the K_t for the resin cement. The difference is minimal, however, and since the values of all these materials lie in the area necessary for good insulators, the clinical recommendation of a cavity liner could not be based on this one particular property.

The highest conductivity was found with silicate cement. This probably can be attributed to the presence of high concentrations of both silica and alumina oxide in most commercial products.[27] The conductivity of silica[24] is 2.37×10^{-3} and would thus tend to lower the insulating characteristics of any given material which contained appreciable amounts.

The results of this investigation would seem to bear out the empirical clinical observations that dentin and certain materials used as cement bases are effective thermal insulators. On the basis of the data presented here, no one particular type of material could be considered significantly superior and none is more effective than tooth structure itself in insulating the pulp from thermal shock.

CONCLUSIONS

From the results of this research, it is apparent that many of the materials used willfully or incidentally to insulate metallic restorations from the pulp and thus minimize pain or pathologic condition due to thermal changes are good insulators. This corroborates clinical experience regarding the effectiveness of cement bases in this respect. Human dentin itself is as good as any, and superior to most, of these materials. The investigation can be summarized as follows:

1. A system for establishing accurate relative values for the coefficient of thermal conductivity of poor conducting dental materials and tooth structure has been developed.

2. Previous reported values of the coefficient of thermal conductivity, K_t, for dentin and zinc phosphate cement appear to be high.

3. The mean coefficient of thermal conductivity of dentin was found to be 0.000257 cal. $sec.^{-1}$ cm^{-2} $(°C/cm)^{-1}$ which indicates it to be an effective thermal insulator.

4. Values obtained for specimens of zinc phosphate cement, zinc oxide-eugenol, resin cement, gutta-percha and silicate place all of these materials in the range of insulators, with little difference between them.

5. Water sorption by zinc phosphate cement did not appreciably alter the thermal conductivity of the cement.

6. The use of two different cavity liners only slightly lowered the conductivity of a resin cement.

27. Skinner, E. W. Science of dental materials, ed. 4. Philadelphia, W. B. Saunders Co., 1954.

BUREAU OF ECONOMIC RESEARCH AND STATISTICS

The 1956 survey of dental practice

I. Introduction

This is the third general survey of dental practice conducted by the Bureau of Economic Research and Statistics. Content of the three surveys has varied somewhat. The first, called the 1950 Survey of the Dental Profession, did not include income and expenses of dentists but did include a record of patients seen and treatments provided during the course of a week. The 1953 Survey of Dental Practice covered the income and expenses of dentists during 1952 and a number of other questions relating to dental practice.

The current survey repeats many of the questions asked in the 1953 survey, notably questions on income and expenses. Questions repeated are those relating to factors in which substantial year-to-year changes are expected and measurement of trends is indicated. The current survey includes several new questions, on such matters as fees, types of insurance held and size of office.

The type of information obtained in this survey is needed by the profession for many purposes: preparation of legislative testimony, planning dental

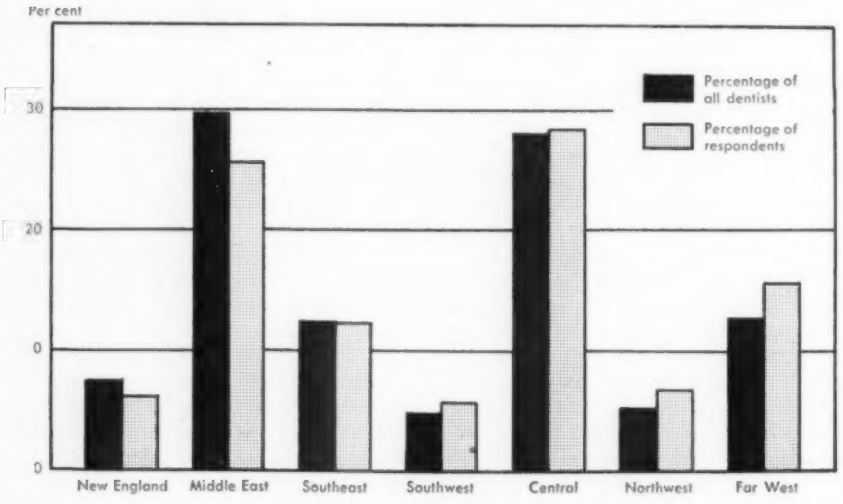


Fig. 1 • Geographical distribution of all dentists and of dentists participating in the 1956 Survey of Dental Practice

Table 1 • Geographical distribution of all dentists and of dentists participating in the 1956 Survey of Dental Practice

Region	Percentage distribution of all dentists*	Percentage distribution of respondents
New England	7.3	6.1
Connecticut	1.8	1.8
Maine	.5	.6
Massachusetts	3.9	2.8
New Hampshire	.3	.3
Rhode Island	.6	.4
Vermont	.2	.2
Middle East	29.8	25.5
Delaware	.2	.1
Dist. of Columbia	.9	.8
Maryland	1.2	1.3
New Jersey	3.9	3.0
New York	15.4	13.6
Pennsylvania	7.4	5.9
West Virginia	.8	.8
Southeast	12.2	12.1
Alabama	.9	1.1
Arkansas	.5	.6
Florida	1.9	2.1
Georgia	1.1	1.1
Kentucky	1.2	1.4
Louisiana	1.2	.9
Mississippi	.6	.4
North Carolina	1.4	1.2
South Carolina	.5	.3
Tennessee	1.5	1.5
Virginia	1.4	1.5
Southwest	4.8	5.7
Arizona	.4	.6
New Mexico	.2	.3
Oklahoma	1.0	1.0
Texas	3.2	3.8
Central	28.0	28.3
Illinois	4.8	6.7
Indiana	2.3	2.0
Iowa	1.8	2.0
Michigan	4.0	4.6
Minnesota	2.6	3.0
Missouri	2.7	2.2
Ohio	5.0	4.8
Wisconsin	2.8	3.0
Northwest	5.2	6.7
Colorado	1.0	1.2
Idaho	.3	.4
Kansas	1.1	1.3
Montana	.4	.7
Nebraska	1.1	1.3
North Dakota	.3	.4
South Dakota	.3	.4
Utah	.5	.8
Wyoming	.2	.2
Far West	12.7	15.6
California	9.3	11.5
Nevada	.1	.1
Oregon	1.3	1.7
Washington	2.0	2.3
	100.0	100.0

*Based on a count of dentists listed in the 1956 American Dental Directory. Excludes dentists in federal dental services.

care programs, recruitment of high-caliber dental students, adjustment of salary scales of salaried dentists, determination of need for more dentists and new dental schools, showing states and regions where dentists are needed most, providing data for governmental and voluntary agencies making studies of health problems, delineating trends in dental practice, answering inquiries from diverse sources, estimating the number of persons seeing the dentist and so forth. Such information is also utilized by many individual dentists in comparing their practices with national and state averages with respect to such factors as income, professional expenses and degree of busyness.

Numerous and unpredictable new uses for dental practice information arise from time to time. Aside from the specific needs and uses such as those listed, it is probably a safe generalization that the more information an organized group has about itself, the more able it is to accomplish its purposes.

The questionnaire was sent on April 30 to every third dentist on alphabetical lists of all civilian dentists in the United States. Twenty-two per cent of the questionnaires sent out were returned, compared to 18 per cent in the 1953 Survey of Dental Practice. The number of usable questionnaires was 6,044, compared to 4,552 in the 1953 survey. Statistics from the present survey will be more complete and more reliable than those from the previous survey.

Table 1 and Figure 1 show that the geographical distribution of survey respondents was very similar to distribution of all dentists. As usual, there was a slight under-response in the New England and Middle East regions. There was a relative over-response in the Southwest, Northwest and Far West regions. The other two regions, the Southeast and Central, were represented in almost exactly the correct proportion.

The largest percentages of questionnaires were returned by dentists in Mon-

Table 2 • Age distribution of all dentists in 1954 and of dentists participating in the 1956 Survey of Dental Practice

Age	Percentage distribution of all dentists in 1954*	Percentage distribution of respondents
—24	.6	.1
25—29	8.2	4.0
30—34	14.4	21.1
35—39	10.9	19.5
40—44	10.0	11.7
45—49	11.0	10.3
50—54	11.2	11.0
55—59	11.6	9.1
60—64	8.8	7.0
65—69	5.2	3.4
70—74	3.9	1.5
75—	4.2	1.3
Total	100.0	100.0

*Based on a large random sample of dentists in mid-1954.

tana (38 per cent); Arizona (33 per cent); Utah (31 per cent), and Wyoming (30 per cent). The smallest percentages of questionnaires were returned by dentists in South Carolina (14 per cent); Massachusetts (16 per cent); Mississippi (16 per cent); New Jersey (17 per cent), and Rhode Island (17 per cent).

Table 2 presents a comparison of the age distribution of dentists participating in the survey with that of all dentists. These figures show that there was a relative over-response from dentists in their thirties, who comprised 40.6 per cent of the survey respondents compared to only 25.3 per cent of dentists in general.

The age distribution of "all dentists" includes the retired dentists. Therefore, the fact that the percentages of respondents in age groups above 60 is lower than the percentages for "all dentists" does not indicate the degree of under-response among these upper age groups. Past experience has shown, however, that the rate of response from older dentists is lower than that from younger dentists. The only age group showing a pronounced under-response is the 25 to 29 age group. Possibly this is because many dentists in this age group are in military service and because dentists in practice for less than a year might have tended to discard their questionnaires for the reason that they had little data to report.

As usual, nonmembers of the American Dental Association did not respond as well as members. Of all respondents, 96 per cent indicated they were members of the Association in 1955. It is estimated that among all active dentists between 80 and 85 per cent were members in 1955.

So far as can be determined, then, the dentists responding in this survey are a satisfactory cross-section of all active dentists in the United States. The greatest deviation from perfect representation is with respect to membership. This is not a serious defect in the sample because such a large majority of dentists are members of the Association.

The fact that the net sample is representative with respect to three measurable variables does not fully establish the validity of the sample. Undoubtedly the 22 per cent who responded are different from the 78 per cent who did not respond in ways other than responsiveness. The crucial question is to what extent these differences introduce biases in the data collected.

There is some evidence to indicate

that the more successful dentists respond in greater proportions than do the less successful dentists. For example, a better response is generally obtained from regions where average income is higher. On the other hand, total gross income of dentists as calculated from average gross incomes reported in the 1953 survey was less than the amount estimated from a nation-wide survey of family spending for dental care, the National Family Survey of Medical Costs and Voluntary Health Insurance conducted by Health Information Foundation.

Considering all available evidence, it appears the bias resulting from nonresponse is not large and does not impair in any way the usefulness of the mail survey in showing differences in income and other factors according to age, state, size of city and type of practice. Most statistics of this type can be obtained only through the employment of a mail survey.

The next article in this series will include information on the income of dentists according to state, age and other factors.

BUREAU OF LIBRARY AND INDEXING SERVICE

The American Dental Association Film Library

The film, "Root End Amalgam Technic in the Practice of Endodontia," reviewed in this article, is available for rental ($2.50) from the Film Library, 222 E. Superior St., Chicago. Please consult the booklet, *Audio-Visual Materials in Dentistry,* and the supplement for additional films on endodontics available from the Film Library.

FILM REVIEW

Root End Amalgam Technic in the Practice of Endodontia • 16 mm., color, sound, 16 minutes. Produced in 1955 by Samuel Luks, D.D.S. Photography by Robert Carlin. For purchase arrangements, write to the producer, 40 Park Ave., New York 16.

The film demonstrates the plugging of an amalgam filling into the root end of an upper central incisor when the normal approach to the root canal is blocked. Roentgenograms are used to show that this technic is indicated: (1) when the pulp chamber and root are completely calcified; (2) when the roentgenograms reveal a periapical radiolucent area; (3) when a broken instrument is present and cannot be removed, and (4) when a silver point in a wide canal with lateral spaces is misused. Roentgenograms show that gutta-percha cannot be used since it cannot be condensed into the apical third of the root.

The procedures for carrying out the amalgam technic on an upper right central incisor where the root is calcified are then demonstrated. After the administration of the anesthetic, a flap is reflected over the four upper central incisors, the labial plate of bone is removed from the apical region of the tooth involved and all the pathologic tissue in the area shown. The root end is cut off, the orifice of the root canal located, and the preparation of the root is begun.

Oxidized cellulose is packed into the open cavity and around the root end to produce a dry field. The method for delivering amalgam particles to the prepared root end and removing excess particles is shown. The flap is replaced and sutured. Postoperative roentgenograms and photographs taken four weeks later show satisfactory healing. Various patients in whom this technic was used are shown preoperatively and postoperatively. The conditions shown include a completely calcified root one year after treatment, a cast gold post, a funnel shaped apex, and a broken instrument blocking a root canal.

This film is well organized; the photography and continuity are good. It is more suitable for dental practitioners than for dental students. Endodontists and oral surgeons may find it interesting.

Cases and Comments

ACRYLIC RESIN JACKET CROWN WITH A GOLD COPING

By A. H. Tamarin, D.D.S., Chicago.

The acrylic resin jacket crown with a gold coping has advantages over a similar jacket crown without a gold coping. There is greater adhesion between the inner surface of the gold coping and the outer surface of the prepared tooth after cementation and, in addition, there is greater retention and adaptability of the acrylic resin to the outer surface of the gold coping. This adaptability results from the direct processing of the acrylic resin to the gold coping. The stability and retention is due to the rigidity of the outer surface of the gold coping, as well as to the mesiodistoincisal projections. These projections serve as anchorage for the acrylic resin material. These factors counteract the resiliency of the acrylic material and, as the fluids of the mouth are prevented from penetrating between the resin and the coping, distortion and discoloration of the acrylic resin is avoided. The jacket crown is easily constructed.

25 East Washington Street

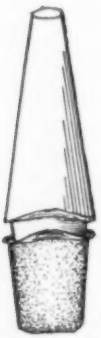


Fig. 1 • A stone model of the tooth is saturated in a dish of water and the surplus water removed. The prepared portion of the model is dipped in a dish of molten inlay wax and withdrawn instantly. The uniform and well-adapted wax coping thus obtained will not adhere to the stone model. The surplus wax is removed easily from the model with the point of a sharp knife cutting around the outer border of the gingival step. This procedure isolates the coping.

Fig. 2 • Wax sprues are attached to the center of the wax coping at the incisal edge and to the ends on each side of the mesial and distal surfaces at the juncture of the incisal edge.

Fig. 3 • After the casting of the coping, the central sprue is cut off completely, and the mesial and distal sprues are cut off leaving slight projections at each end of the coping. These projections serve as a retention for the acrylic resin. The entire coping is now covered with an opaque resin material.

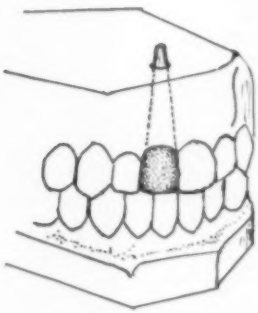


Fig. 4 • The gold coping on the stone model is mounted into position on the articulator, and a wax model is carved of the tooth involved. The wax model is ready for processing.

Fig. 5 • The jacket crown with the gold coping is now completed.

MOUTH GAG FOR A TETANUS PATIENT

By Lloyd W. C. Tang, D.D.S., Sherman, Texas.

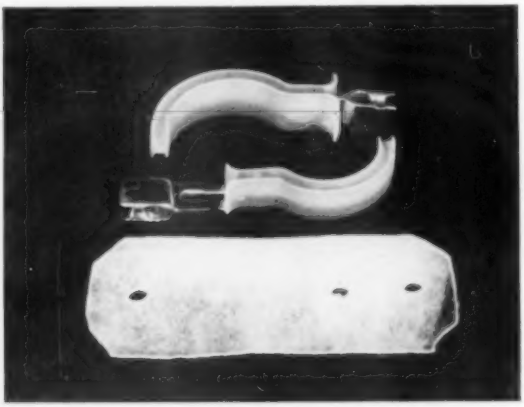
During a tetanus convulsion, the patient exhibits a tremendous degree of generalized muscular rigidity. Even in mild tetanus when the patient remains conscious and responds to light and sound, he has no control over convulsion.

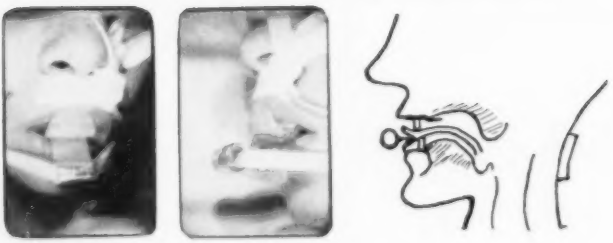
The patient always has the tendency to thrust his tongue forward and outward. The next moment, he may "lock" his jaws so tightly that they cannot be opened either by hand or with a strong Molt's mouth gag. This clenching of the jaws often catches the tongue and cheeks, which will not be released until the convulsive spell is over. The reflex of pain is not enough to free the jaws from biting the cheeks or tongue. Even with immediate sedation, it will take a few minutes to relax the patient.

Treatment for tetanus may last from a few weeks to a few months. Repeated tongue and cheek biting will result in ulceration or even in a part being completely severed. A device has been designed to prevent this. It has been used a few times, and the results have proved satisfactory.

The device is composed of a Y-shaped metal retainer inserted into a Berman plastic airway, whose end is shortened so as to minimize laryngeal irritation. In order to keep the appliance in place, a piece of bandage gauze is threaded through the hole of the metal retainer and tied around the back of the patient's neck. The neck is protected from abrasion with a felt pad (illustration).

This appliance will depress the tongue and prevent it from falling back; suffocation is





Above: Device made of Y-shaped metal retainer inserted into plastic airway prevents tongue and cheek biting during tetanus convulsion. Felt pad prevents abrasion at back of neck. Left: Device in place. Right: Sagittal section of head showing felt pad at back of neck and appliance inserted between teeth, depressing tongue.

avoided. Tongue thrusting is prevented also. The device stops the biting of the tongue and cheeks because whenever the jaws are closed the anterior teeth will bite on the plastic airway. In addition, it facilitates aspiration of mucus and eliminates tracheotomy when tetanus is mild.

512 North Walnut Street

UNSUSPECTED AREAS OF INFECTION

By John Oppie McCall, D.D.S., New York

Many oral diagnosticians and oral surgeons have expressed the opinion that impacted third molars, if completely buried, do not become infected. The same opinion is held regarding symptom-free bone regions in which rarefaction, after tooth extraction, is found.

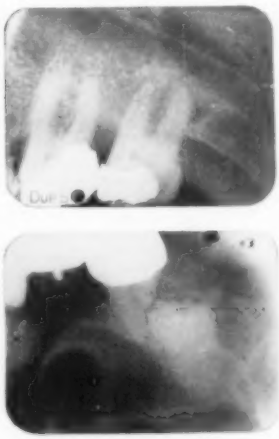
The question as to whether or not infection may become established in such instances is of importance where systemic disease is believed to be attributable directly or in part to focal infection. Failure to locate and eradicate all foci will result in failure in therapy and will throw doubt on the validity of the original etiologic diagnosis, with possible serious consequences to the patient.

A 55 year old man was referred for diagnosis of possible foci of infection, his chief complaint being recurrent iritis. His general health was good except for residual rheumatoid arthritis, which had been brought under control by cortisone therapy.

Roentgenographic examination disclosed an upper third molar impacted high in the bone and in close relation to the maxillary sinus (illustration, above). There was also rarefaction of the bone in the region from which a lower left third molar had been extracted (illustration, below). There were no symptoms or visible inflammation in either region. The history did show, however, that the lower third molar had been extracted because of an acute pericoronal infection.

Removal of the impacted molar and curettage of the lower third molar socket were recommended. Observations were as follows:

Upper molar: The pathological report stated that the tissue removed in the course of exposing the tooth showed "inflammatory cells and fibroblasts throughout an edematous and congested stroma." The bacteriological report showed a large number of *Streptococcus hemolyticus* and *Streptococcus viridans*, all of high toxicity. The organisms were inhibited *in vitro*, by chlortetracycline and penicillin but were resistant in varying degree to several other antibiotics. Sinus examination on that side was negative. A diagnosis of infected impacted molar was made.



Above: Impacted upper left third molar in close relation to maxillary sinus. Below: Rarefaction of bone in region from which lower left third molar had been extracted

Lower molar residual area: The bacteriological report showed many Str. *viridans*, a moderate number of nonhemolytic streptococci and a moderate number of *Staphylococcus albus*, all of high toxicity. The organisms were inhibited by chlortetracycline and oxytetracycline but were resistant to penicillin, erythromycin and several other antibiotics. A diagnosis of residual infection was made.

944 Park Avenue

MULTILOCULAR CYST

By Alvin L. Krasne, D.D.S., and Lawrence B. Krasne, D.D.S., North Miami, Fla.

On September 22, 1955, a 42 year old white man was examined prior to the extraction of teeth in preparation for complete dentures. Routine periapical roentgenograms showed evidence of a large pathological area on the left side of the mandible at the bicuspid region. Lateral jaw projections were then taken.

The roentgenograms revealed a large trilobed cystic region extending from the crest of the ridge to the inferior border of the mandible and from the first bicuspid region to the second molar region anteroposteriorly. The mandibular canal had become depressed to the inferior border. Films showed the right side to be normal. There were no subjective symptoms, and the history was negative; there was no swelling or exudate.

Roentgenogram reveals trilobed cystic region

Local anesthesia was selected for use in the surgical removal of this cyst. On October 14, two of the lobes were enucleated *in situ;* the third lobe collapsed and emitted a yellowish caseated material. The crypt was curetted, irrigated, and sutured; there was no need for a drain. Healing was uneventful, and the patient experienced no paresthesia.

Pathological examination of the specimen confirmed the diagnosis of a multilocular cyst and indicated strands of squamous epithelium surrounding various sized spaces containing degenerated epithelial cells and cholesterol slits with connecting giant cells.

This report demonstrates the importance of complete examination and full mouth roentgenograms of edentulous regions prior to the replacement of teeth.

771 N.E. 125th Street

MALUNION OF MANDIBULAR FRACTURE

By Paul E. Jurgens, D.D.S., M.S.D., Decatur, Ill.

A 37 year old man was transferred to the Minneapolis Veterans Administration Hospital on January 5, 1955, for treatment of a malunion of a mandibular fracture.

On December 9, 1954, the patient had been knocked unconscious in an automobile accident. He was taken to a hospital for treatment. Approximately 36 hours after admission, he became confused and excitable. Roentgenograms revealed a fracture through the symphysis of the mandible.

On December 20, 1954, he was transferred to a second hospital. He continued to be confused and excitable, and sedation became necessary. Neurological examination revealed no abnormal reflexes, but there was evidence of blood in both ear canals. Roentgenograms of the head showed mandibular fractures through the symphysis and left condyle. The diagnosis at the third hospital, Minneapolis Veterans Hospital, was basal skull fracture, cerebral contusion, residual disorientation states and malunion of a fractured mandible.

The patient's past history was essentially negative as was the family history. There had been no malignancies, tuberculosis, diabetes or cardiac disease in his family.

Examination • Intraoral examination revealed that the left mandible from the midline posteriorly was approximately 1 cm. inferior to its normal position. The teeth in this segment did not occlude with the maxillary teeth (illustration, above and center). The second molar on the left side did have a point contact, however, with the maxillary left second molar when the teeth were brought into occlusion.

The symphysis fracture had healed solidly in malunion. Digital examination did not elicit any movement in this region.

The teeth had minimal caries activity and were in good repair. The mandibular right central incisor was missing. A severe Class I malocclusion was present with approximately 1.5 cm. of overbite. The lips, tongue, floor of mouth, buccal parietes, gingiva, palate and throat were normal.

Finger pressure over the condyles did not elicit pain, nor was there any discomfort during the various mandibular movements.

The patient was a well developed, white man who appeared weak. He was not oriented as to time or place but could answer questions about his past quickly. He complained of severe pain in the frontal region.

The left pupil was slightly larger than the right. Both pupils reacted equally to light and accommodation. All the lung fields were clear to percussion and auscultation. The heart was not enlarged, had a regular rhythm and no murmurs. All of the neurological reflexes were normal.

The white cell count on admission was 8,000, with 67 per cent neutrophils, 28 per cent lymphocytes, 3 per cent monocytes, 1 per cent eosinophils, and 1 per cent basophils. The hemoglobin was 15.1 Gm. The Kahn test was negative. Urinalysis showed a specific gravity of 1.016 with no traces of albumin, sugar, erythrocytes or leukocytes.

The roentgenogram of the chest was normal.

The posteroanterior, right and left views of the head were negative for a skull fracture. The head roentgenograms again revealed the symphysis fracture with displacement and the condylar fracture on the left with a right angle displacement mesially.

Dental roentgenograms did not reveal anything of importance. The fracture line and the displacement of the teeth in the left mandibular anterior region were noted. No roots were exposed in the fracture line.

Treatment and Course • Soon after the patient was admitted to the Minneapolis Veterans Hospital, a neurological examination was performed to re-evaluate his mental status. The consultant found reflexes active but equal bilaterally. There was no change to indicate intracranial bleeding. It was recommended that no prolonged or deep level anesthesia be administered.

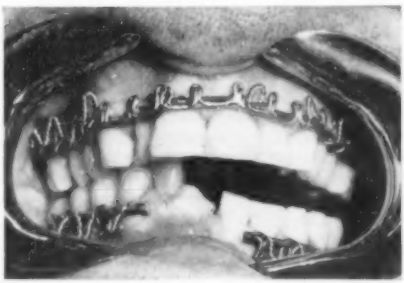
The patient was placed in restraints for two days to prevent his falling from the bed or leaving the ward. His mental condition improved daily. His chief complaint was frontal pain, which was controlled with acetylsalicylic acid, 0.6 Gm., and codeine, 30 mg., every four hours if needed.

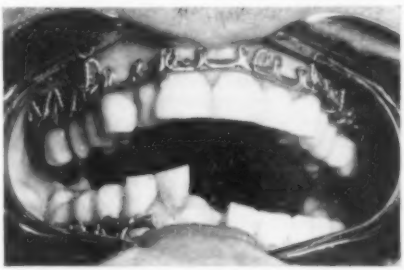
Because of the lapse of time since the accident and absence of subjective symptoms, an open reduction of the condylar fracture was not planned.

On January 12, 1955, under local anesthesia, a Jelenko arch was placed on the maxillary teeth, and split Jelenko arches and Ivy loops were placed on the mandibular teeth.

The patient was taken to surgery on January 13, 1955, to refracture his mandible. Penicillin, 300,000 units every 12 hours, was started prophylactically 24 hours before surgery. Premedication was given: chloral hydrate, 4 cc., the night before and the morning of surgery; meperidine hydrochloride (Demerol), 0.75 mg., and atropine, 0.4 mg., one hour before surgery. The anesthesia used was thiopental sodium-curare, nitrous oxide and oxygen, administered by means of an orotracheal tube.

The patient was placed in a supine position. The face and neck were prepared with Phisohex and a 1:1,000 aqueous solution of benzalkonium chloride (Zephiran). Draping was done in the usual manner. Procaine, 1 per cent with 1:1,000 epinephrine, was infiltrated through the soft tissues overlying the symphysis to minimize capillary bleeding from scar tissue. An incision, approximately 6 cm. in length, was made approximately 1 cm. below the lower border of the mandible, extending below the symphysis along the right inferior border.





Above: Anterior view of patient's occlusion with mandible in closed position. Jelenko splints had been placed the day prior to surgery. Center: Anterior view with mouth open. Below: Lateral view three months postoperatively

The subcutaneous fat, connective tissue and platysma muscle were separated with sharp dissection, and the mandible identified. All bleeding was controlled. The periosteum was incised with a scalpel and raised on the buccal and lingual sides with a periosteal elevator. The fracture site was easily identified because of the displacement of the fragments.

The fracture had been comminute; the main fracture line ran in an angular direction from the midline to below the right mental foramen. An osteotome was placed in what was thought to be the region of previous fracture, and with manual manipulation refracture was accomplished. All interposing fibrous and calloused tissues were removed with a curette. Ochsner clamps were used to grasp the fragments, and the mandible was placed in what was thought to be its correct position. The repositioning was difficult to accomplish because of the previous communition of the fracture.

With a dental bur one hole was drilled centrally in each fragment approximately 1 cm. from the fracture line. The underlying soft tissues were protected with a brain retractor from injury by the bur. Water was sprayed over the region during drilling to remove bone chips and to prevent overheating of bone. A 24 gauge wire was passed through the holes and twisted together over the labial plate of bone. The wire was not tightened to its fullest extent, in order to allow intermaxillary elastics to pull the bone into its correct position. The wire was tight enough, however, to prevent rotation or gross displacement of the fragments.

The periosteum was closed with no. 000 chromic catgut, and the platysma muscle and subcutaneous tissues were closed with no. 0000 chromic catgut suture. The skin was approximated with no. 0000 and no. 00000 silk suture. A Barton bandage-type pressure dressing was applied after placement of the intraoral elastics. The patient withstood the procedure well.

The next day the teeth were in proper occlusion. The elastics on the right side were replaced with stainless steel wire. The elastics on the left side were changed.

Four days postoperatively all the elastics were replaced with the stainless steel wires, which held the teeth and bone securely in their proper relationships.

No postoperative complications ensued from the surgery. The skin sutures were removed six days postoperatively. A collodion dressing was placed to support the wound.

The patient left the hospital on January 20, 1955. Six weeks later the stainless steel wires and Jelenko arches were removed, and the postoperative results were evaluated.

Results • In April, 1955, the postoperative models of the patient's occlusion were studied. The teeth were now in acceptable occlusion (illustration, below). The intracranial symptoms had disappeared and the patient was able to work again.

160 North Edward

FUSED LOWER MOLARS

By Reuben Resnick, Brooklyn.

A routine examination of a patient revealed fused second and third molars. The molars had a common pulp chamber.

133 Smith Street

Fused second and third molars

SUPERNUMERARY CENTRAL INCISOR

By Stanley N. Schwartz, D.D.S., Forest Hills, N. Y.

Examination of a 60 year old man revealed the presence of a mesiodens, a supernumerary central incisor between the two permanent central incisors. The tooth was in perfect alignment. The roentgenogram revealed a perfectly formed and situated root (illustration).

Mesiodens between central incisors

The mesiodens resembled or was identical with the normal tooth form.

This mesiodens is interesting because of its perfect form and its excellent occlusion and alignment with the adjacent central incisors. A mesiodens of this sort may be a modern example of the teeth of those extinct primates who had three incisors.

71-57 Austin Street

CONTROL OF BLEEDING WITH INTRAVENOUS ESTROGENS

By P. B. Whittington, Jr., D.D.S., Greensboro, N. C.

On January 11, 1956, a 61 year old woman was seen with the chief complaint of hemorrhage of the gingiva. Examination revealed advanced and generalized periodontitis and many loose, abscessed and carious teeth. The periodontitis had been present for several years and had gone unattended. Past history also revealed that she was a hemophiliac, hemorrhaging each time a tooth was extracted. The last episode of bleeding of the gingiva had occurred several months previously. She had been hospitalized at that time for ten days and had received two blood transfusions. A reaction followed each.

A bacteriologic smear indicated the presence of Vincent's organisms. Penicillin mouthwash was started January 12 and by January 17, some improvement was noted. In view of the severity of the condition, the patient was hospitalized January 18. Every effort was made to bring the condition under satisfactory control to avoid removal of teeth. After a few days, however, it was felt that all remaining teeth had to be extracted, since the alveolar processes were involved.

The red blood cell count was 3,560,000; white blood cell count, 11,110, and blood platelets, 342,000. Bleeding time was 5 minutes, 45 seconds; coagulation time, 2 minutes, 30 seconds. Weight was 162 pounds; blood pressure, 170/100.

The patient was started on medication to lower her blood pressure, and arrangement was made to give her fresh blood at the time of surgery. On January 19, the 20 remaining maxillary and mandibular teeth were extracted, and the tissues were closed with 25 sutures. The patient bled profusely during the operation and was given 500 cc. of fresh blood.

Postoperatively, the patient continued to bleed freely at irregular intervals. Ice packs were used, and sponges were applied to the gingiva. Mouthwashes of a mild solution of peroxide and of strong tannic acid were started. Large doses of vitamin K were administered daily.

By January 20, oozing of blood had subsided. Except for one more instance of bleeding, the patient's progress was satisfactory, and she was discharged January 23.

The following evening, the patient had to be readmitted for control of profuse hemorrhage of the gingiva. Examination showed generalized tissue bleeding from several places in the mouth. Morphine and a large dose of vitamin K were administered. Sponge packs were applied to the gingiva. The patient continued to bleed intermittently, and four hours later was hemorrhaging freely. Additional packs were applied to the mouth, but bleeding was only partially checked. Sporadic bleeding continued the next day, and the patient's condition began to deteriorate. She felt weak, dizzy and did not wish to be disturbed.

On January 25, the patient's condition was such that emergency measures were indicated. Usual treatment having failed, it was decided on the basis of recent reports in the literature[1-4] to try intravenous estrogens. Twenty milligrams of Ayerst's preparation of water-soluble conjugated forms of mixed estrogens (Premarin) was given intravenously at 1:50 P.M. By 2:30 P.M. bleeding had completely stopped and did not recur. Later the patient was given a transfusion of 500 cc. of fresh blood. After this, the patient's general condition improved, and she made an uneventful recovery.

Although the mechanism of intravenous estrogens in the control of bleeding is not fully understood, it is felt that the administration of Premarin Intravenous was responsible for the successful control of the bleeding.

230 Medical Arts Building

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2. Jacobson, P. A unified concept of "spontaneous" bleeding (Editorial). Current Medical Digest 21:30 Nov. 1954.

3. Jacobson, P. A unified concept of spontaneous bleeding. West. J. Surg. 63:711 Dec. 1955.

4. Menger, H. C. Estrogen given parenterally to control epistaxis and hemorrhage after adenoidectomy: preliminary report. J.A.M.A. 159:546 Oct. 8, 1955.

The Reader Comments

THE JOURNAL *devotes this section to comment by readers on topics of current interest to dentistry. The editor reserves the right to edit all communications to fit available space and requires that all letters be signed. At the request of the author, signatures will be deleted before publication. Printed communications do not necessarily reflect the opinion or official policy of the Association. Your participation in this section is invited.*

The Editor

ALCOHOLICS ANONYMOUS

It is my purpose to present some thoughts about alcoholism, based upon my experiences as an active alcoholic for several years. I hope to help overcome the prejudices that have been linked with this subject by helping to develop constructive and intelligent attitudes toward it. Contact with the author may be made through THE JOURNAL, thus respecting the anonymity tradition of Alcoholics Anonymous fellowship, of which the author is a member.

Alcoholism is a compulsive, uncontrollable form of drinking. There is no point in scolding, shaming or urging the use of will-power alone because a real alcoholic is unable to control his drinking. He drinks because he feels "compelled" to; drinking in moderation is completely impossible, even though the alcoholic may be fully aware that he is harming himself. Modern treatment is aimed at helping alcoholics deal with their problems without the use of alcohol at all.

I am often asked, "Don't you ever feel like taking a drink?" Of course I do. The diabetic probably would like to eat a pound of candy, but he knows the consequences if he does. So, too, the alcoholic. One drink is too much and 1,000 not enough.

If alcohol in any small way interferes with your life, look out. There is a fine line between a problem drinker and a true alcoholic. If you seem to feel the need for alcohol to meet life's problems, you have an alcoholic problem. The treatment and results can be the same. No use changing your pattern of drinking nor the type or brand, it will not help.

I was first a social drinker. It was our way of family life, and I enjoyed it. I had no respect for anyone who drank too much, yet I wound up as such a person. Treatment in an institution followed by acceptance of the Alcoholics Anonymous therapy has restored me to a respectable human being. I am no more ashamed of my disease and its treatment than was my father with his diabetes.

There is no cure for alcoholism, but the alcoholic can be made sober, and the A.A. fellowship of over half a million alcoholics offers the opportunity to maintain sobriety. Man's own honesty and desire is his only guarantee. A.A. offers suggested steps, time proven over a 20 year span of active alcoholics' experiences.

I reached the point in my active drinking days where I really felt that I was a better dentist because of the added confidence alcohol seemed to give me. Toward the end, many of my patients thought otherwise.

There are some 65 or more million of our population who drink. Perhaps four million of these have an alcoholic problem, and another four million are truly alcoholics. Your chances of becoming an alcoholic are not very great, yet if it does happen, you have one of two choices; stop drinking or continue and rest six feet under.

If you are a social drinker and want to learn something about your own drinking future, if you are a social drinker now and want to stay that way, if you want to avoid the possibility of becoming an alcoholic, or if you want to help some friend, I suggest that you read *Just One More* by James Lamb Free, Coward-McCann, Inc., New York, publishers.

As a rehabilitated alcoholic and a member of Alcoholics Anonymous, I too enjoyed the book. Our "bible" is the A.A. *Big Book*, and the fellowship of every member of A.A. is our inspiration for strength, understanding and hope. Our motto is:

"God give me serenity to accept the things I can not change, courage to change what I can, and wisdom to know the difference."

NOVEMBER 1956

LON W. MORREY, D.D.S., EDITOR
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THE Journal OF THE AMERICAN DENTAL ASSOCIATION

Editorials

Pain: its prevention, control and treatment

Pain, a subject which occupies a major portion of this issue of THE JOURNAL occupies a major place in the lives of most dentists. The general practitioner of dentistry's understanding of the nature of pain, his ability to prevent its occurrence while operating and his skill in relieving the distress of neuralgia, odontalgia and other dental disturbances, influence in no small way his professional success. As has been pointed out time and again, the fear of pain probably keeps more people away from the dental office than any other one cause. Few dentists today are incapable of preventing and relieving pain for most patients. Many, however, are unskilled in coping with the fear exhibited by overapprehensive persons.

As R. Gordon Agnew points out in his introduction to the three symposium papers on pain by Collins, Agnew and Borland published on pages 529 to 542, until recently relatively little attention was paid to the basic background of the modalities of dental pain. The three authors provide such a background and in addition emphasize the important role which the general practitioner must play when called upon to deal with pain problems. Dr. Agnew states:

> Many of the problems associated with pain fall squarely within the field of responsibility and authority of the general dental practitioner. His patients and his medical colleagues will increas-

ingly expect of him, in this as in other important areas, the understanding, screening ability and general competence inherent in the term "guardian of the oral cavity." It is to be emphasized that, while in difficult cases the end-result of skilled screening processes may indeed be referral to a specializing colleague, the key figure in the problem is the general practitioner. Indeed, it would seem obvious that, as the profession of dentistry has evolved and special fields have developed, each movement of decentralization has actually widened the responsibility of the nonspecializing dentist to whom the patient, as an individual, is of prime concern.

The general practitioner will find these additional obligations highly rewarding. He will discover pain to be not an enemy, but an actual ally. His heightened interest will lead him to make significant observations and correlations in his practice. He will be stimulated to develop the capacity for effective communication with his patient and the establishment of a high level of rapport and confidence through which the patient may gain objectivity and may avoid the many sequelae of fear. His familiarity with the phenomena of pain will be found to constitute a broad and potent qualification in the arena of public relations.

THE JOURNAL is pleased to present in one issue the three symposium papers by Collins, Agnew and Borland, plus four others by Hoffman, Ludwick and Lynn, Olsen and Viegas dealing with different important aspects of the subject. It is hoped that every member will find them sufficiently valuable to make them a permanent part of his operatory library.

In appreciation

The concert by one of the world's great orchestras at the just-past annual session of the American Dental Association in Atlantic City was a stirring experience for convention visitors. The program, presented by the Philadelphia Orchestra under the direction of Eugene Ormandy, drew a capacity crowd of more than 4,000 persons. The Association, on behalf of the dental profession, extends its profound gratitude to the dental division of Johnson and Johnson which made the concert possible. Not only is the company's significant contribution to the annual meeting appreciated, but it also merits special attention as an outstanding example of cooperation between industry and the profession.

Make yours a golden contribution

The Association's 1956-57 Relief Fund campaign is called to mind both by the cover of this issue of THE JOURNAL and by the letter and packet of relief seals which all members received recently from the Council on Relief.

The Relief Fund, a unique institution among professions, is now in its fiftieth year. This year's slogan, "Make yours a golden contribution," is doubly appropriate as it recalls the birth date of the relief program and its birthplace as well—the city of the Golden Gate. The Fund is an indirect result of the San Francisco fire that followed the earthquake of April 18, 1906. Dentists from all parts of the United States contributed freely for the relief of their stricken colleagues. When their needs were met, a balance of $4,969.75 remained which became the nucleus of the national dental relief fund. Thus out of the ashes and anguish of one of the nation's greatest catastrophes arose a great city, San Francisco, and a great benevolent project, the Relief Fund program of the Association.

The sole purpose of the Fund is to aid dentists and their families in distress. Every dollar contributed goes for relief purposes. All administrative costs are met by the Association. Half of each contribution is returned to the constituent society for use by its own relief fund; half is deposited in the Association's Relief Fund. Only the interest from the Relief Fund can be used; the principal is kept intact, destined to benefit needy dentists down through the centuries.

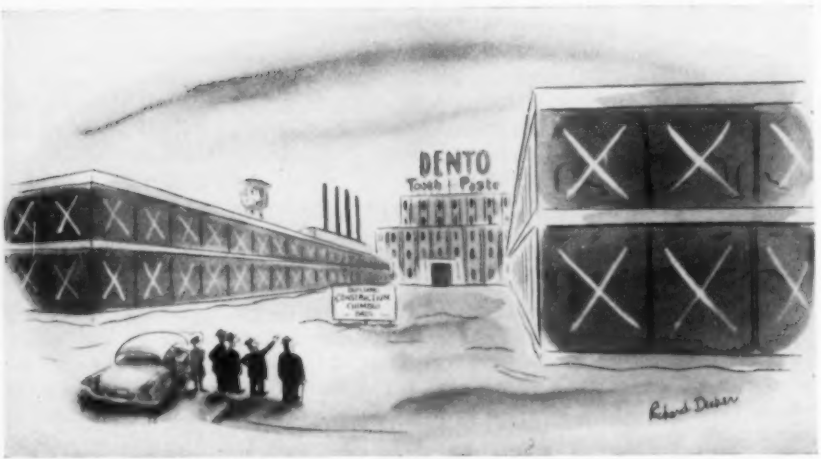
There will always be a need for the Association's Relief Fund even though O.A.S.I. now includes dentists and promises a measure of relief for older dentists who qualify. But each year finds a growing number of younger dentists who, because of ill health and other misfortune, need financial aid. It is for them and their families that the Association's relief program is, and will continue to be, a logical source of assistance.

Contributors in the past have cooperated wonderfully; that is why the Fund has been able to carry out its noble work. Last year contributions to the Relief Fund totaled $114,961, an all-time high, and the Relief Fund now amounts to about $932,000. In the past fifty years $1,027,545.67 has been allocated from the Fund in grants to dentists in distress. Because of the increasing number of dentists requiring assistance and because of the increasing costs of meeting their needs, an increase in the annual contribution of each of us is in order.

If, this year, each member would contribute the equivalent of an air-mail stamp a week—that is, three dollars—the annual contribution would total more than a quarter of a million dollars—sufficient to provide adequately but not lavishly for those members of the profession who have fallen on evil days.

Let each of us commemorate the golden anniversary of the Association's humanitarian project by making our contribution this year a golden one.

A nation's humor pronounces a nation's judgment



"Well, gentlemen, there we are. Ready to go into production. Now all we need is a good comedian to sell the stuff."

By permission.
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Both the leadership and composition of a Congressional committee which will handle national health legislation in 1957 are sure to be drastically changed, regardless of the election's outcome.

Deaths and resignations have brought about this situation in the House Committee on Interstate and Foreign Commerce. This is the group which, during the two-year life of the 84th Congress (1955-56), processed and worked for passage of bills authorizing federal subsidies for construction of medical and dental research facilities; establishment of traineeships in dental public health; inauguration of continuing and special surveys of sickness throughout the country; provision of an adequate building to house the National Institute of Dental Research and a number of lesser bills involving the practice of dentistry.

J. PERCY PRIEST DIES

On October 12, Rep. James Percy Priest, the committee's chairman and an influential member of the Democratic leadership on Capitol Hill, died suddenly in his home city of Nashville. Two months previously, the committee's second-ranking Republican member, Rep. Carl Hinshaw of California, died in Washington. Within the past 24 months, the House has lost seven members by death, four of whom were on the Commerce Committee: Rep. Dwight L. Rogers (Fla.) and Rep. William T. Granahan (Pa.), as well as Representatives Hinshaw and Priest.

Earlier this year, Rep. Arthur G. Klein, a Democrat, left the committee—and the House—to accept a New York judgeship. Adding to the attrition was the primary defeat in North Carolina of another Democrat who took an active part in handling of medical and dental legislation, Rep. F. Ertel Carlyle.

That health measures will occupy an important place on Congressional calendars in the coming year is assured by the attention which President Eisenhower and Adlai E. Stevenson have given this subject in their election campaigns, as well as by the emphasis placed upon it in many of the state contests for House and Senate seats.

On the Senate side, no more than two or three membership changes are likely on the Labor and Public Welfare Committee, which has charge of national health bills under consideration in that branch of Congress. This is true even should the voters give the Republicans control, in which case the one major alteration would be the deposal of Senator Lister Hill (D., Ala.) as chairman. But no matter how the election turns out, a full scale overhaul of the House Interstate and Foreign Commerce Committee is in prospect.

If the Democrats retain a majority in the House, the group's new chairman will be Rep. Oren Harris, of Arkansas. A Republican victory would restore Rep. Charles A. Wolverton, of New Jersey, to the chairmanship, a post he held in the 83rd Congress (1953-54).

PRIEST'S SUCCESSOR

Representative Harris' primary interest on the committee has been transportation and communications. In his political philosophy he is somewhat to the right of center. National health legislation has been the interest of Representative Wolverton who, while antagonistic toward proposals which would give the federal government control over educational institutions or voluntary health in-

surance plans, has been impatient with many of the arguments advanced by professional associations in the health sciences.

The Department of Defense has made it known that it will ask for no further extension of the doctor-draft law, provided Congress authorizes the President to make "selective" calls under the regular draft act.

Under such authorization, which Congress will be requested to grant next year, the White House could call upon Selective Service to furnish such numbers of physicists, engineers, dentists or holders of other vocational skills needed by the Armed Forces. Only those persons could be called up involuntarily under this plan who were vulnerable for military duty under the basic draft law.

The doctor-draft act is scheduled to end June 30, 1957. Two more callups of physicians are in prospect before that date, but none for dentists.

During November, small teams of members of the National Advisory Council on Health Research Facilities will visit training institutions, hospitals and clinics throughout the country to obtain first hand information on research construction needs. Data which they collect will influence decisions of the Council, when it meets in December, on applications made for federal financial assistance by medical and dental schools and other nonprofit institutions.

Less than 1 million dollars of 30 million available in 1956-57 for matching grants has been allocated to date. The greater part of the appropriated funds is expected to be committed in December.

The U. S. Public Health Service has created a new position in recognition of its increasing responsibilities and in anticipation of still more duties to be imposed by Congress next year.

John D. Porterfield, M.D., reported to USPHS headquarters the third week in October to fill the new post—Assistant to the Surgeon General. A former career officer in the service, he was Ohio State health commissioner from 1947 to 1954 and director of mental hygiene and correction from the latter year until his resignation to return to the USPHS commissioned corps.

Leroy E. Burney, M.D., Surgeon General, stated that Dr. Porterfield will devote his time to development and coordination of existing and prospective programs.

International Correspondence

NEWS FROM GREAT BRITAIN

The British Dental Association through its journal publishes an educational number (101:5 Sept. 4, 1956) which is well worth reading. The educational supplement gives a complete directory of dental schools and examining bodies in England, Wales, Scotland, Northern Ireland and Eire. There is also a most informative article on higher dental degrees and diplomas. It may not be generally known that nearly all 19 examining bodies in dental subjects in Great Britain grant higher degrees or diplomas in dentistry. The article rightly states that "higher degrees, by encouraging further study and by directing such study to a specific end, are of great value. Although it would be easy to exaggerate the importance of the possession of higher degrees, they provide useful labels which are of value in forming a general assessment of a man's academic stature and in an increasingly bureaucratic world a greater significance is likely to be attached to them."

ROYAL COLLEGE OF SURGEONS

Sir Wilfred Fish, as director, has issued progress report no. 1 of the scheme to establish the new department of dental science at the Royal College of Surgeons of England.

The new building is well under way. Temporary accommodation has been provided in the department of physiology. Mr. B. Cohen from South Africa who holds an M.S.D. degree from Northwestern University has been appointed as an oral pathologist to the department. The Leverhulme Trust (£6,000 a year for seven years) has made this early appointment possible. Further appointments, including that of a biochemist, will be made later.

The director has been exploring research facilities at other laboratories in Great Britain, Scandinavia and Switzerland, and no apparatus will be purchased until the immediate need for it has been established. To date, as the result of a general appeal, there has been received: Leverhulme Trust, £6,000 a year for seven years; Deeds of Covenant, £6,400 a year for seven years, and subscriptions and donations, approximately £14,050.

The honorary fellowship of the College has been conferred on I. S. Ravdin, M.D., of Philadelphia, who is chairman of the board of regents of the American College of Surgeons and professor of surgery at the University of Pennsylvania.

NATIONAL HEALTH SERVICE

The report of the Central Health Services Council for the year ended December 31, 1955, has been published by Her Majesty's Stationery Office. The minister of health, Mr. Robert Turton, in his foreword describes as "a valuable discussion" the Council's report on fluoridation of domestic water supplies as a means of reducing dental decay.

"All kinds of fears had been expressed and objections raised to the proposal," he says, "and the Council have helped to advance what I am satisfied is the right policy by recording their conclusion, and that of the Standing Medical Advisory Committee, that despite many years of observation and investigation there is no scientific or medical evidence available which suggests that there is any risk in drinking water containing fluoride in the low concentration proposed."

Another useful publication issued by the Ministry of Health in 1956 is called *Haemophilia—Some Useful Hints and Advice*. Advice on dental treatment and care of the teeth is included.

ITEMS OF INTEREST

The Dentists' Register 1956, published by the late Dental Board of the United Kingdom, now replaced by the General Dental Council, contains some statistical tables on the growth of the profession and its ability to meet the expanding demands for its services.

In 1955, 588 dentists qualified in Britain, which is a higher number than in any year since 1952. Of these, 126 were graduates of the University of Sydney. This indicates quite an influx of young dentists from Australia, probably for short periods of postgraduate study or practice.

A new chair of operative dental surgery has been established at the University of Liverpool, and Mr. Frank Lawton has been appointed to it. Mr. C. F. Ballard has been appointed professor of orthodontics at the Institute of Dental Surgery, Eastman Dental

Hospital, London. Mr. A. O. Mack became professor of dental prosthetics at Durham University.

The profession is disturbed that the objection made by the British Dental Association to the Privy Council against the raising of the registration fee to £4.10. by the new General Dental Council has been rejected; the Association has been informed that the Privy Council is satisfied that the increase of the retention fee is fully justified and accordingly has approved the increased fee.

A small book published by the late Dental Board of the United Kingdom and edited by Prof. H. H. Stones with a team of collaborators has produced the following comment from a reviewer.

"The Editor pays modest but proper acknowledgment to the American Dental Association for its permission to use many of the ideas which abound in that body's excellent publications: the reviewer believes that he is giving the highest possible praise in stating that, in his opinion, this book is superior to any comparable American publication that he has seen."

G. H. Leatherman,
D.M.D., F.D.S., R.C.S., F.A.C.D.

NEWS FROM THE REPUBLIC OF ARGENTINA

Edgardo Casella, president of the Federación Odontológica Argentina, and Victor J. Chagra, treasurer, were fatally injured in an automobile accident in the Province of Santa Fé. Both had attended the Jornadas Odontológicas presented by the Círculo Odontológico Santafésino. Loss of these two colleagues has caused profound grief.

Prof. Alejandro Ceballos has been appointed acting president of the Universidad Nacional de Buenos Aires. The executive head of the government has appointed Hector J. Roccatagliata acting dean of the Facultad de Odontología de Buenos Aires. The dean has appointed Pablo H. Brea college secretary.

The board of consultants of the college is composed of: Ciro Durante Avellanal and Gabino F. García, representatives appointed by the acting dean; José Guilenia Oribe and Ricardo Augusto Crespi, elected by the professors; Jorge Mario Testa, Adolfo Esteban Peluffo and Luis E. Lifac, elected by the dental alumni majority vote and Armando S. Turano by the minority vote. Dental students in their last two years are represented by Ruben Raccagni, Romás C. Silva, Adolfo Weschler and Julia Persoglia. The consultants act in an advisory capacity only.

Ricardo Augusto Crespi,
correspondent from Buenos Aires

News of Dentistry

HARRY LYONS INSTALLED AS PRESIDENT; ALSTADT NAMED PRESIDENT-ELECT; HOUSE UPHOLDS BOARD ON FTC RULES CHANGE

Harry Lyons of Richmond, Va., dean of the School of Dentistry, Medical College of Virginia, was formally installed as president of the American Dental Association at its 97th annual session October 1-4 in Atlantic City, N. J. Named unanimously by the 416 member House of Delegates to the post of president-elect was William R. Alstadt of Little Rock, Ark. Dr. Alstadt, an orthodontist, who is 40 years old, is the youngest president-elect in Association history.

Eugene R. Westcott of Atlantic City, N. J., was chosen first vice-president. Harold E. Cafferata of Reno, Nev., became second vice-president, and John Knutson, assistant surgeon general and chief dental officer of the U. S. Public Health Service, third vice-president.

The delegates unanimously re-elected Gerald D. Timmons of Philadelphia speaker of the House. Dr. Timmons is dean of Temple University School of Dentistry.

Four members of the Board of Trustees were re-elected for new three year terms. They were: Charles H. Patton of Philadelphia, Third District; Edward R. White of Jersey City, Fourth District; Howard B. Higgins of Spartanburg, S. C., Fifth District, and Paul Jeserich of Ann Arbor, Mich., Ninth District. Robert J. Wells of Chicago defeated Robert I. Humphrey, also of Chicago, for the post of Eighth District Trustee. Dr. Wells succeeds L. H. Jacob of Peoria, Ill.

In major actions taken during the four day meeting, the House voted to press for amendment of the Federal Trade Commission rules governing the dental laboratory industry, declined to approve training for laboratory technicians solely on the vocational or secondary school level and opposed extension of the special physician-dentist draft action. Additionally, the delegates approved a restatement of the "dental standard" for hospitals so as to permit the section on oral surgery to be an integral part of a department of dentistry.

Greetings were received from President Eisenhower commending the profession for its "record of splendid accomplishment" in care of patients, in dental education, scientific research and dental public health. A scientific session of essays, clinics, motion pictures and exhibits continued throughout the week. Total attendance was 14,235, a figure topped only by the 14,741 record set in San Francisco last year.

DENTAL LABORATORY RULES

The debate in the House of Delegates over the Federal Trade Commission *Rules for the Commercial Dental Laboratory Industry* had its roots in events which began in 1954. At that time, the National Association of Dental Laboratories asked the FTC for a set of fair practice rules for the laboratory industry.

The American Dental Association's Council on Dental Trade and Laboratory Relations, concerned that the *Rules* reflect properly the functions of the craft and its adjunctive relation to the profession, made suggestions on the wording of the proposed *Rules*. In June of 1955, the Council testified before the Federal Trade Commission. It urged elimination of language which indicated that the laboratories were responsible for the "design" or "occlusion" of a dental appliance. It recommended that the *Rules* declare that only licensed dentists and

those authorized by state law might properly deal with laboratories.

In October 1955, the Association's House of Delegates meeting in San Francisco commended the Council for its work. On November 4, the *Rules* were promulgated. Several important Association recommendations had been ignored.

The Association protested and asked for new hearings. It presented a brief in support of its position for amendments to the *Rules*. If proper amendments were not made, the *Rules* should be revoked, it declared.

Events following promulgation of the *Rules* alarmed the dental profession. The Board of Trustees reported "there is accumulating evidence that a segment of the dental laboratory craft is deliberately using the *Rules* in an effort to secure status beyond that permitted by the dental practice acts of the various states." Independent counsel was retained by several societies, and a brief requesting immediate revocation of the *Rules* was submitted to the FTC by six Eastern societies. Four society resolutions were transmitted to the House of Delegates for consideration in Atlantic City.

Debate on the FTC code extended over two days. On Wednesday afternoon, letters were received from the FTC announcing that hearings would be held in the near future on the Association's request for amendment and that the request of the six Eastern societies for immediate revocation had been denied.

At the end of the debate, the House unanimously passed with one amendment the statement of policy presented by the Reference Committee. The resolution instructs the Council on Dental Trade and Laboratory Relations to seek appropriate amendment of the *Rules* at the coming hearings. The Board of Trustees is directed to convene a special session as soon as the FTC decision is rendered. If, at that time, the *Rules* are not fully satisfactory, immediate revocation is to be sought.

Additionally, if there is accumulating evidence that the craft seeks to use the *Rules* to gain professional status, revocation is to be sought at once, and the Board is directed "to reconsider the present liaison with the National Association of Dental Laboratories." NADL cooperation in obtaining amendments will be welcomed by the Association "as an evidence of good faith." If the *Rules* are satisfactory, the Association will help use them to eliminate illegal activities by unethical laboratories.

The statement of policy points out that the Association has always considered laboratory technology, not as an independent industry but as a craft, adjunctive to the profession.

TRAINING OF TECHNICIANS

A second aspect of dental laboratory relations acted on by the House of Delegates dealt with the training of laboratory technicians. The delegates approved changes in the curriculum included in the *Requirements for the Accrediting of a School for the Training of Dental Laboratory Technicians* of the Council on Dental Education. Subjects are: orientation, laboratory technics of fabrication of restorative appliances, tooth form and applicable dental nomenclature, dental materials, ethics and jurisprudence, use of "work authorizations" and laboratory management.

Resolutions urging that the training of technicians be on a vocational secondary school level only were rejected.

Additionally, the delegates unanimously opposed NADL certification of dental laboratories and technicians. That program will be considered by the profession "as a formal effort toward the invasion of professional rights by the dental laboratory craft," the delegates said. Furthermore, they stated, the state-level accreditation program of the dental societies can fulfill "every valid objective" of the NADL certification plan.

The delegates, in another action, decided to inform the NADL that the Association's Council on Dental Education would study the desirability of developing an acceptable program for the certification of auxiliary personnel but declared that training must be done under programs approved by the Association.

They voted also to call to the attention of the NADL the recent indictment of four denture firms for violation of the federal mail order denture act. The indictments were described in a reference committee report as "evidence of productive activity against illegal dental practices at the national level."

HOSPITAL DENTAL SERVICE

The Joint Commission on Accreditation of Hospitals is composed of representatives of the American Medical Association, American Hospital Association, American College of Physicians, American College of Surgeons and the Canadian Medical Association.

Over a period of years, the Joint Commission has been developing standards for accreditation of hospitals throughout the country. One of the standards was a "dental standard" which was undesirable to the dental profession and which the Association felt actually worked a hardship on established and efficient dental services in many hospitals.

The Association's Council on Hospital Dental Service has been negotiating with the Joint Commission for revision of the "dental standard." Progress was made. As a result, the Council brought to the House in Atlantic City a restatement of the "dental standard" which it felt could serve as the basis for further discussion with the Joint Commission. With some revision, the Council's restatement was adopted by the House. As approved, it provides that in larger hospitals oral surgery shall be an integral part of the department of dentistry. In smaller hospitals and in those where the principal activity of the dental department is oral surgery, this service may be organized as a section of the surgery department "coequal with other surgical specialties." The Council's own *Basic Standards*, used in approving dental services in hospitals, was amended to be consistent with the revised "dental standard." Negotiations will continue to have the House-approved "dental standard" adopted by the Joint Commission.

In another action affecting hospitals, the House voted to transfer from the Council on Hospital Dental Service to the Council on Dental Education the task of examining for approval or nonapproval hospital dental internship and residency programs.

DOCTOR DRAFT

Extension of the doctor draft law beyond its July 1, 1957, expiration date was opposed by the delegates. Defense Department officials had assured the Association that the needs for dental personnel by the Armed Forces can be met through voluntary enlistments and by recent dental graduates. The House urged the continuation of national, state and local advisory committees to Selective Service to assure the "orderly induction of future dental graduates who are basically liable under the law for military service."

Also in the area of defense, the delegates recommended that the rank of Surgeons General of the Army, Navy and Air Force be advanced to the next higher grade. Additionally, it transferred the duties of the Subcommittee on Civil Defense to the Council on Federal Dental Services.

PUBLIC HEALTH

Four resolutions in the field of public health were adopted by the House. The definition of dental health care presented by the Council on Dental Health to the House in 1955 was approved in modified

form. Dental health care is defined as "the sum total of the diagnostic, preventive, remedial and restorative services rendered dental patients by practitioners legally authorized to perform such services."

The second resolution added to the "Principles for Determining the Acceptability of Dental Prepayment Plans" a statement that "the method of authorization of dental health care under a prepayment plan should prevent any interference with the dentist-patient relationship or the professional judgment and decision of the dentist."

A third resolution referred to the Council on Dental Health a proposal of the Colorado State Dental Association that the American Dental Association seek approval of federal grants-in-aid specifically earmarked for state health department dental programs.

In a fourth action, the House approved a Massachusetts resolution recommending amendment of the public assistance sections of the Social Security Act to permit the states to determine the methods of payment for medical services provided public welfare recipients.

LADIES' AUXILIARY

Formation of a national ladies' auxiliary was authorized by the House. The ladies' group was asked to submit proposed bylaws to the 1957 annual session.

BUDGET

On the last day of the meeting the House approved a $2,335,847 budget recommended by the Board of Trustees. Estimated income is $2,422,000, leaving an excess of anticipated income over operating expenses of $86,153. Of the amount appropriated, $788,620 is for administration, $65,795 for annual session, $253,470 for bureaus, $515,176 for Councils and divisions, $612,786 for publications, and $100,000 for the contingent fund. Income from membership dues is expected to be $1,500,000; from advertising and subscriptions for Association publications, $446,500; earnings on investments, $110,000; $115,000 from the Council of the National Board of Dental Examiners; $85,000 from exhibit space rentals; sale of educational materials, $60,000; Division of Educational Measurements, $95,000, and miscellaneous income, $10,500.

DENTAL HEALTH WEEK

The Board of Trustees reported to the House that a survey of constituent and component societies revealed a preference for the current date of National Children's Dental Health Week and that no change was necessary, therefore.

COUNCIL MEMBERS

Council members named to serve for three years on the 17 Councils of the Association were:

Constitution and Bylaws

Fritz A. Pierson, Nebraska
Thomas A. Price, Florida

Dental Education

John E. Buhler, Georgia
Maynard K. Hine, Indiana
H. S. Huxtable, Wisconsin
Harold W. Oppice, Illinois

Dental Health

R. F. D. Johnson, Minnesota
E. B. Nuttall, Maryland
R. W. Openshaw, Southern California

Dental Research

Alfred Asgis, New York
J. Roy Blayney, Illinois

Dental Therapeutics

H. T. Knighton, Virginia
F. J. Orland, Illinois
D. Weisberger, Massachusetts

Dental Trade and Laboratory Relations

J. Fred Folley, New York
John Steen, Southern California

Federal Dental Services

M. E. Chapin, North Carolina
E. Jeff Justis, Tennessee

Hospital Dental Service

John P. Looby, Pennsylvania
O. J. McCormack, New York

Insurance

E. D. Calkins, Wisconsin
L. R. Ludwigsen, California
C. E. Peterson, Connecticut

International Relations

L. M. Ennis, Pennsylvania
J. A. O'Keefe, District of Columbia

Journalism

Ernest Hurley, Oregon
Vincent Lawlor, Pennsylvania

Judicial

Barney E. Farmer, Texas
W. P. McNulty, Indiana

Legislation

F. J. Herz, California
Matthew Besdine, New York
Ralph E. Creig, Ohio

Membership

W. D. Diessner, Minnesota
A. Brooks Drake, West Virginia

National Board of Dental Examiners

Woodson T. Birthright, District of Columbia
W. A. Dickson, Minnesota
George S. Easton, Iowa

Relief

Joseph Martin, New York
E. L. Pessagno, Jr., Maryland

Scientific Session

D. R. Mackay, Minnesota
Walter Monia, Southern California

OTHER ACTIONS

In additional actions, the House elected 601 dentists to life membership, amended the *Bylaws* to provide student membership status for dentists engaged in full-time advanced study courses of not less than one academic year's duration and increased the size of reference committees from three to five members.

The delegates commended Congressmen Fogarty, Hill, Murray, Priest and Long for "their valuable assistance" in securing increased funds for dental research and for the NIDR building.

A resolution of the District of Columbia Dental Society proposing that federal and state governments declare the payment of all medical and dental expenses tax deductible was sent to the Council on Legislation for study and report at the 1957 annual session.

The House added to the *Requirements for the Approval of Examining Boards in Dental Specialties* a paragraph stating that "the division of the practice of dentistry into specialties depends upon a logical separation of dental services into categories characterized by fundamentally different objectives and distinct biological and physical approaches to diagnosis and treatment, involving knowledge and skills beyond those which can normally be expected for the general practice of dentistry—rather than a fragmentation of dentistry based upon technics or procedures."

In a further resolution, the Delegates amended the *Bylaws* so that men nominated by the American Association of Dental Examiners to the American Dental Association's Council on Dental Education and Council of the National Board of Dental Examiners might be eligible to serve a second term even if they lost their status on a state board of dental examiners. Previously, a Council member nominated by the examiners' group was automatically ineligible for a second term if he ceased to be a dental examiner.

The *Bylaws* were amended also to provide that the professional conduct of every member shall be governed not only by the codes of ethics of the national and state organizations but also by the code of the component society within whose jurisdiction he practices.

The House endorsed the invitation of the United States Government to the World Health Organization to hold the eleventh World Health Assembly in the United States in 1958.

It approved a resolution recognizing the efforts of the late Charles E. Woodbury in the founding of the Woodbury Study Club for promotion of better operative dentistry. The resolution had been submitted by the Nebraska state society.

SCIENTIFIC SESSION

Essays, clinics and motion pictures were presented daily throughout the meeting. The Council on Scientific Session presented awards for outstanding exhibits. Winners, in three categories, follow:

Individuals • Jacob Lifton, New York, for an exhibit on rehabilitation of patients with gross dentofacial malformations; Michael B. Callito, Newark, N. J., Lyon P. Strean, West Point, Pa., and Lyndon A. Peer, Newark, N. J., for an exhibit showing stress as an etiologic factor in human and experimental cleft palate; Cloyd S. Harkins and William R. Harkins, of Osceola Mills, Pa., and John F. Harkins, Wesleyville, Pa., for an exhibit on technical problems involved in cleft palate prosthesis; Theodore Weisse, Pittsburgh, for wax models and charts demonstrating dental embryology; Henry I. Copeland, Jr., Washington, D. C., for an exhibit of the recently developed panoramic dental x-ray; Joseph L. Bernier, Bethesda, Md., for an exhibit on the histopathology of roentgen ray lesions.

Government Agencies • Department of Health, Education and Welfare, for an exhibit showing 50 years of Food and Drug Administration activity; Navy Dental Corps for its exhibit of its casualty treatment training program; Indiana State Board of Health for an exhibit on its dental health programs; New York State Department of Health for a series of backlighted transparencies telling the story of fluoridation in New York; Dental Training Center, Veterans Administration West Side Hospital, Chicago, for an exhibit on stabilization of maxillofacial fractures; U. S. Army Dental Corps, for a demonstration of the use of closed circuit color television in dental education.

Organizations • University of Kansas School of Dentistry, University of Kansas School of Medicine, Arthur F. Lindquist, all of Kansas City, Mo., and David W. Robinson, Kansas City, Kan., for an exhibit on the team approach to the cleft palate and cleft lip problem; Academy for Oral Rehabilitation of Handicapped Persons, for photographs and illustrations of oral conditions in handicapped persons; Northwestern University Dental School, Orion H. Stuteville and Richard W. Tiecke, Chicago, for an exhibit on lesions of the mouth and jaws; Dental Guidance Council for Cerebral Palsy of New York City, United Cerebral Palsy Association, Inc., and Joseph H. Kauffmann, New York, for an exhibit on dentistry for the cerebral palsy patient.

The past presidents' luncheon was held October 3 in the Bakewell Room at Haddon Hall. In attendance were (standing, l. to r.): H. B. Washburn, 1947-48; Bernerd C. Kingsbury, outgoing president; Leslie FitzGerald, 1953-54; LeRoy M. S. Miner, 1936-37; (seated, l. to r.): C. Willard Camalier, 1937-38; Marcus Ward, 1938-39; Otto W. Brandhorst, 1953-54; Philip E. Adams, 1949-50, and J. Ben Robinson, 1942-43.

GENERAL MEETING AND OTHER EVENTS

The dental schools of the United States are in the midst of a financial crisis that can be solved by sharply increased support from industry, labor, foundations and government, Bernerd C. Kingsbury, Association president, said in his presidential address at the General Meeting Tuesday evening, October 2. An overflow crowd of 4,000 heard the president at the Warner Theater on the Boardwalk.

Dr. Kingsbury said that the nation's 45 dental schools currently need more than 100 million dollars for equipment and buildings. They cannot survive on tuition alone, he declared.

"During the last four years while dental students were paying the schools 55 million dollars, the schools were spending more than 75 million dollars," he stated. "The difference has to be made up mainly through gifts and endowments."

At the same time that the schools face a financial crisis, enrollment continues at peak levels, the dental executive pointed out.

Dr. Kingsbury praised the action of Congress in boosting support of dental research. He called for the universal adoption of fluoridation as an effective means of reducing tooth decay.

Dr. Kingsbury's address was followed by a concert by the Philadelphia Orchestra under the direction of Eugene Ormandy. The dental division of Johnson & Johnson underwrote the major portion of the cost of the concert as a service to the dental profession.

DENTAL MANPOWER NEEDS

Among guests who addressed the House was Harold Oppice, dental member on the Health Resources Advisory Committee to the Office of Defense Mobilization and former president of the Association.

The number of dentists must be significantly increased if the needs of the nation are to be met, Dr. Oppice warned. Military requirements for dental manpower will be met without difficulty, but the needs of the civilian population will not be. By 1960, Dr. Oppice stated, the

dentist-population ratio will be lower than before Korea.

This decreased ratio is expected because population is increasing faster than the number of dental graduates. By 1960 the population is expected to be 177 million, he reported.

Contributing to the problem of meeting the nation's dental needs is the increased demand for dental services on the one hand and the difficulty of recruiting dental school faculty on the other. Teacher shortages will be rendered more acute as new schools open and facilities expand, Dr. Oppice pointed out.

Turning to the needs of the Armed Forces, Dr. Oppice stated that the increasing number of graduates and the decrease in resignations from the dental corps would make it possible to meet military needs for the next two years from dentists with a basic selective service liability.

"The ultimate effectiveness of any mobilization effort is conditioned by the total manpower available for that purpose," Dr. Oppice declared. "Dentistry is to be congratulated for increasing the number of graduates by seven per cent in the past five years, but this rate of increase must be stepped-up," he said. "It is hoped that efforts to increase the number of graduates can be intensified so that the dental health of this nation can be maintained and constantly improved."

INTERNATIONAL GUESTS

Several guests who addressed the House brought greetings from other countries. They included Manelik Gasso, Dominican Republic Dental Society; Don Gullett, secretary of the Canadian Dental Association; Roberto Ruff, president-elect of the Mexican Dental Association, who presented a plaque from the Mexican profession to President Kingsbury and

Eugene Ormandy (center) conducted the Philadelphia Symphony Orchestra in a concert following the General Meeting October 2. Mr. Ormandy is shown at a reception with (l. to r.) Thomas P. Fox, chairman of the Defense Department's dental advisory committee; President Kingsbury; Eugene Westcott, general chairman of the local arrangements committee, and LeRoy Ennis, a past president of the Association.

International guests who brought greetings to the House of Delegates Wednesday, October 3 were (l. to r.): Rufino Achacoso and Lt. Col. Vivencio P. Santos, Philippine Dental Association; Enrique E. Muller, Argentine Dental Association, and Javier Pietropinto, official representative from Uruguay.

Secretary Hillenbrand; A. K. Ovadia, representing the Twelfth International Dental Congress; Riis Klausen, assistant secretary of the Fédération Dentaire Internationale; Rufino Achacoso and Lt. Col. Vivencio P. Santos, official representatives of the Philippine Dental Association.

Other international guests were: Ramon E. Mena and Pedro Olavarrieta, delegates from the Dominican Republic Dental Society; Enrique E. Muller, Argentine Dental Association; Poul Harris, general manager of the Danish dentists' supply houses, and Javier Pietropinto, official representative from Uruguay.

In all, 109 dentists from other countries registered for the annual session.

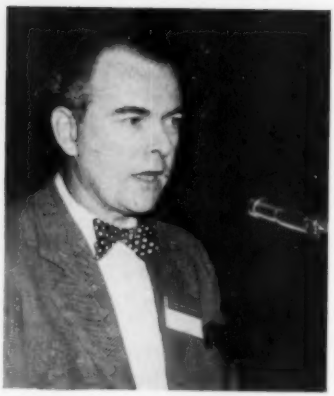
A luncheon for international guests was held in the Benjamin West Room of Haddon Hall Tuesday October 2. The Council on International Relations was host for the affair.

OTHER GUESTS

Greetings were brought from Mayor Joseph Altman of Atlantic City by David B. Allman, M.D., president-elect of the American Medical Association. Other guests included Mr. Nathan Cooper, vice-president, National Association of Dental Laboratories; Mr. Sterling Balaski, president, Dental Dealers of America; Mr. Harvey Rosenbluth, president, Dental Manufacturers of America, and Mr. G. Milton Goolsby, president, American Dental Trade Association.

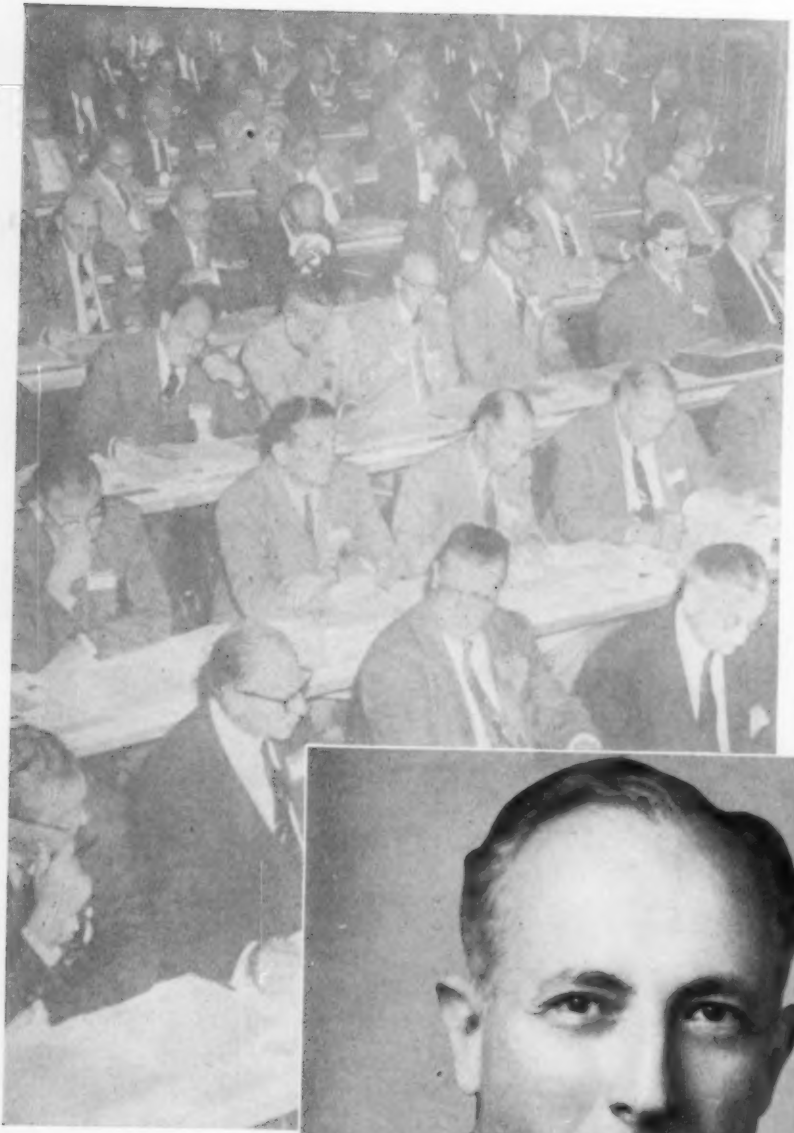
INSTALLATION CEREMONIES

The gavel of the Association presidency was presented to incoming president Harry Lyons by Bernerd C. Kingsbury at the closing session of the House. C. Willard Camalier, a past president, welcomed Dr. Kingsbury into the Past Presidents' Club.



Among guests who addressed the House were (small photos): Don Gullett, Canada; Manelik Gasso, Dominican Republic; Riis Klausen, Denmark; (large photos, above) Roberto Ruff, Mexico, who presented a plaque to Dr. Kingsbury, and (below) David Allman, M.D., president-elect of the American Medical Association.

Strolling along the Boardwalk in Atlantic City are prominent women guests and members of the women's entertainment committee (above). Left to right are Mrs. Philip A. Baratta, vice-chairman of the women's entertainment committee; Mrs. Harry Lyons, wife of the president-elect; Mrs. Bernerd C. Kingsbury, wife of the president; Mrs. Eugene R. Westcott, Sr., chairman of the women's entertainment committee; Mrs. Francis J. Herz, wife of the first vice-president, and Mrs. Charles S. Jonas, vice-chairman, women's entertainment committee. Below: At the final session of the House of Delegates, outgoing president Bernerd C. Kingsbury (left) hands the gavel to incoming president Harry Lyons. Right: Dr. and Mrs. Kingsbury were honored at the traditional president's dinner, main social event of the annual session.



Facing Page
Harry Lyons, President

Above
William R. Alstadt, President-Elect

ACTIONS OF THE BOARD OF TRUSTEES

The Board of Trustees met prior to and following the meetings of the House of Delegates. Among actions taken by the old Board were the reappointment of Lon W. Morrey of Chicago as editor for another year and the reappointment of H. B. Washburn of St. Paul as treasurer, also for one year.

Additionally, the Trustees named John B. Wilson of San Marino, Calif., chairman of the General Committee on Local Arrangements for the 1960 annual session to succeed the late C. Stanley Rice.

Named to the editorial board of the JOURNAL OF ORAL SURGERY for three year terms were: Malcolm W. Carr of New York, Lon W. Morrey of Chicago and Leroy W. Peterson of Missouri. James R. Cameron of Pennsylvania and Leslie M. FitzGerald of Iowa were approved as consulting editors.

The new Board, meeting at the close of the annual session, approved new chairmen for six Association councils. Chairmen of 11 other councils were reappointed. Heading the councils are (new chairmen designated by an *): Fritz A. Pierson, Nebraska, Constitution and Bylaws; J. H. Eshleman,* Pennsylvania, Dental Health; Thomas J. Hill, Ohio, Dental Research; Lester W. Burket, Pennsylvania, Dental Therapeutics; Walter E. Dundon, Illinois, Dental Trade and Laboratory Relations; F. J. Reichmann, Oklahoma, Federal Dental Services; Frank B. Hower, Kentucky, Hospital Dental Service; John S. Eilar, New Mexico, Insurance; Carl A. Laughlin,* West Virginia, Dental Education; Oren A. Oliver, Tennessee, International Relations; J. C. A. Harding,* California, Journalism; C. E. Rutledge,* California, Judicial; J. Claude Earnest,* Louisiana, Legislation; John R. Wallace, Massachusetts, Membership; H. R. Bleier, Wisconsin, Relief; Robert I. Humphrey,* Illinois, National Board of Dental Examiners; Charles S. Kurz, Illinois, Scientific Session.

The Board appointed Victor H. Levitz of New Jersey, David E. Hunn and Joseph P. Scola, both of New York, to represent the Association on the National Health Council. The Council is a voluntary organization of some 60 agencies interested in various aspects of health.

Chosen to represent dentistry on the Inter-Association Committee on Health were Percy T. Phillips of New York; Kenneth Easlick of Michigan; Harold Hillenbrand, Association secretary, and Harry Lyons, Association president. On the Inter-Association Committee, in addition to the American Dental Association, are the American Hospital Association, American Medical Association, American Nurses Association, American Public Health Association and the American Public Welfare Association.

Six men were selected as Association delegates to the Fédération Dentaire Internationale. The delegation will be headed by President Lyons and will consist of Dr. Hillenbrand, Oren H. Oliver of Tennessee, chairman of the Association's Council on International Relations;

The new Board met immediately after the close of the House of Delegates October 4. At the head of the table is the new president, Harry Lyons. Left to right are: Lon W. Morrey, editor; Robert J. Wells, Eighth District Trustee; John R. Abel, Thirteenth District; Percy T. Phillips, Second District; Howard B. Higgins, Fifth District; Edward R. White, Fourth District; Charles Patton, Third District; C. Willard Camalier, assistant secretary; H. B. Washburn, treasurer; William R. Alstadt, president-elect; Gerald Timmons, speaker; Eugene R. Westcott, Sr., first vice-president; Harold E. Cafferata, second vice-president; Arthur W. Easton, First District; Paul H. Jeserich, Ninth District; Lewis W. Thom, Tenth District; Earl G. Jones, Seventh District; Arthur F. Schopper, Sixth District; Clarence S. Renouard, Eleventh District; Miss Doris Nugent, assistant to the secretary, and Harold Hillenbrand, secretary. John W. Knutson, third vice-president, was absent because of another engagement.

Obed H. Moen of Wisconsin, Council secretary, and LeRoy Ennis of Pennsylvania. Earl G. Jones of Ohio is alternate delegate. Appointment of four other alternates was left to the president and secretary.

The Board approved continuation of the present Committee on Association Headquarters. Committee members are: L. H. Jacob, Illinois; L. W. Thom, Minnesota, and H. B. Washburn, also of Minnesota.

Reappointed to the Special Committee on the Survey of Dentistry were: Otto W. Brandhorst of Missouri, chairman; Willard C. Fleming of California; William N. Hodgkin, Virginia; Percy T. Phillips of New York; Paul H. Jeserich of Michigan; Fritz A. Pierson of Nebraska, and H. B. Washburn of Minnesota. President Lyons and President-Elect William R. Alstadt were added to the committee.

Dr. Alstadt resigned his position as Twelfth District Trustee because of his election to the post of president-elect. Harold M. Flickinger of Arkansas was appointed to take Dr. Alstadt's place for the Board meeting. Selection of a Trustee to serve until the conclusion of the 1957 meeting will be made by the president at a later date.

The Board will meet March 28-30, 1957, and again October 28 to November 3, prior to the 1957 annual session in Miami, Fla.

OFFICERS AND TRUSTEES

HARRY LYONS of Richmond, Va., was installed as president of the American Dental Association at the final session of the House of Delegates October 4. The new head of the Association, prior to his election last year to the post of president-elect, had been Speaker of the House since 1952, elected unanimously year after year. He has served the Association also as a member of the Council on Dental Therapeutics, a position he held for 17 years. Dr. Lyons is dean of the Medical College of Virginia School of Dentistry. He is a member of the National Advisory Dental Research Council, which advises the U. S. Surgeon General on the use of federal research funds administered by the National Institute of Dental Research. Recently, he was appointed to another federal committee, the new Health Plan Advisory Committee, a group concerned with developing a Defense Department program of health care for dependents of military personnel.

WILLIAM R. ALSTADT of Little Rock, Ark., Association president-elect, is the youngest man ever to hold this position. He is 40 years old. Previously, Dr. Alstadt was Trustee of the Twelfth District. He has been a member of the House of Delegates for many years and served as a member of the Council on Legislation. An orthodontist, Dr. Alstadt is a diplomate of the American Board of Orthodontics and a former member of the American Association of Orthodontists' board of directors. Dr. Alstadt recently was appointed with Dr. Lyons to the Defense Department's Health Plan Advisory Committee. He is also civilian consultant to the Army-Navy hospital in Hot Springs, Ark., a former president of the Arkansas State Board of Dental Examiners and a former member of the Arkansas Civil Defense Board. Dr. Alstadt is a Fellow of the American College of Dentists.

HAROLD E. CAFFERATA of Reno, Nevada, was elected second vice-president by acclamation. Dr. Cafferata's career in organized dentistry began early. One year after graduation from the University of California School of Dentistry, he was elected president of the Nevada State Dental Society. After serving as president, he became secretary of the Nevada Association, a post he held for six years. Dr. Cafferata has been a councilor of the Pacific Coast Dental Congress for 16 years and for three years has served as its vice-president. He has been a member of the House of Delegates for five years. A Fellow of the American College of Dentists, he is also a Fellow of the International College of Dentists.

EUGENE R. WESTCOTT of Atlantic City, N. J., first vice-president, has served in the local, state and national dental societies. He is a past president of the Atlantic County Society, a trustee of the New Jersey State Dental Society and served the state group also as chairman of its legislative committee. For six years Dr. Westcott was a member of the American Dental Association's Council on Dental Education, serving as chairman in 1952. He has been dental member of the New Jersey State Department of Health. This year, Dr. Westcott was general chairman of the local arrangements committee for the American Dental Association's annual session.

JOHN W. KNUTSON, third vice-president, is assistant surgeon general and chief dental officer of the U. S. Public Health Service. He was commissioned in the USPHS in 1934, became chief of the division of dental public health in 1944 and assistant surgeon general and chief dental officer in 1952. Dr. Knutson is known for his studies in the epidemiology of dental caries, for his research in laboratory and clinical testing, evaluation of dental health programs and for his work in developing topical application of fluoride for caries prevention. Dr. Knutson in 1955 helped develop the first permanent dental program for the World Health Organization, and last year was chosen president-elect of the American Public Health Association, the first dentist to hold that office.

GERALD D. TIMMONS of Philadelphia serves his second term as Speaker of the House. He is dean of Temple University's

School of Dentistry. Dr. Timmons graduated in pharmacy from Valparaiso University in 1917 and received his D.D.S. degree from Indiana University School of Dentistry in 1925. His teaching career in dentistry began at his alma mater. He remained associated with the school until 1940, at which time he left his position as acting dean to become executive secretary for the American Dental Association. In 1942 he became dean at Temple. Dr. Timmons is a past president and a former secretary-treasurer of the American Association of Dental Schools. This year he was installed as president of the American College of Dentists, national honorary society.

LON W. MORREY of Chicago, reappointed editor-in-chief by the Board of Trustees, has served as editor since February 1947. As editor he is responsible for the publication of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, THE JOURNAL OF ORAL SURGERY and DENTAL ABSTRACTS. DENTAL ABSTRACTS, which will be one year old in January, already has 11,000 subscribers in 67 countries. Prior to serving as editor, Dr. Morrey headed the Association's Bureau of Public Relations (1933-46). He began his career in private practice, served as school dentist at Lake Forest, Ill., and was a pioneer director of the dental division of the Illinois State Department of Health. Later, he was chief of the dental health division of the Chicago Board of Health.

H. B. WASHBURN of St. Paul was reappointed Association treasurer by the Board of Trustees, a position he has held for eight years. Dr. Washburn is a former Association president and is a past president of the St. Paul District Dental Society and the Minnesota State Dental Association.

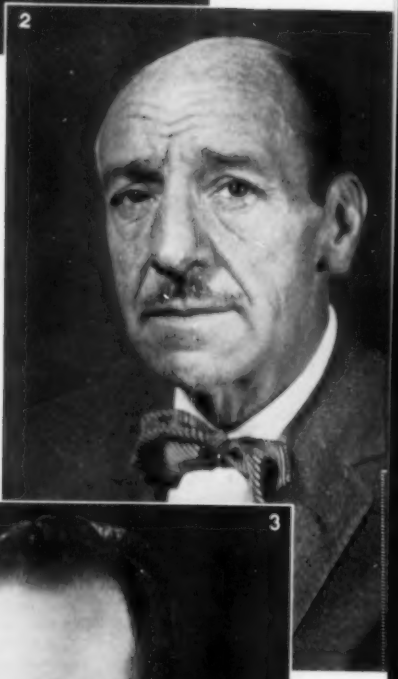
CHARLES H. PATTON of Philadelphia, elected for a second term as Trustee for the Third District, will serve the state of Pennsylvania. A graduate of the University of Pennsylvania School of Dentistry in 1919, Dr. Patton is a practicing orthodontist. He is a past president of the Pennsylvania State Dental Society and of the Philadelphia County Dental Society. In addition to serving the Association as Trustee, Dr. Patton has been a member of its Council on Scientific Session.

EDWARD R. WHITE, general practitioner from Jersey City and Fourth District Trustee, was general chairman of the Association's annual session when it met last in Atlantic City in 1950. He has been first vice-president and member of the Council on Legislation of the Association and president of the New Jersey State Dental Society and the Hudson County Dental Society. Currently, he is a member of the medical-dental liaison committee of the New Jersey State Dental Society and the Medical Society of New Jersey. Dr. White will be Trustee for Delaware, District of Columbia, Maryland, New Jersey and Puerto Rico, the Army, Navy, Air Force, Veterans Administration, U. S. Public Health Service and Panama Canal Zone. It is his second term.

HOWARD B. HIGGINS of Spartanburg, S. C., will be serving his second term as Trustee for a seven state region. The Fifth District covers Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina and Virginia. Dr. Higgins has been a member of the House of Delegates for 18 years. He was Association second vice-president in 1943-44, has served his state and local organization in various capacities and is a past president of the South Carolina Board of Dental Examiners. He has been a member of the Spartanburg County Health Board since 1952.

ROBERT J. WELLS of Chicago is the new Trustee for the Eighth District (Illinois.) Dr. Wells was director of the Chicago Dental Society from 1943 to 1945. In 1945, he was elected secretary of the Society, and then president. In the Illinois State Dental Society, Dr. Wells served three years as a member of the executive council and has been active on many committees of the state organization. He has been a member of the House of Delegates many times and has served the Association also as member and chairman of the Council of the National Board of Dental Examiners.

PAUL H. JESERICH of Ann Arbor, Mich., serves Michigan and Wisconsin as Trustee for the Ninth District. The current term is his second. Presently dean of the University of Michigan School of Dentistry and director of the W. K. Kellogg Foundation Institute, Graduate and Postgraduate Dentistry, Dr. Jeserich has had a long career in dental education. He has been on the school's full-time faculty since 1933, advancing from assistant professor of operative dentistry to the position of dean in 1950. He has served the Association on the Council on Dental Therapeutics, Judicial Council and International Relations Committee. He is a past president of the Michigan State Dental Association.



1 E. R. Westcott
First Vice-President

2 H. E. Cafferata
Second Vice-President

3 J. W. Knutson
Third Vice-President

4 G. D. Timmons
Speaker

5 L. W. Morrey
Editor

6 H. B. Washburn
Treasurer

Charles H. Patton
Third District Trustee

Edward R. White
Fourth District Trustee

Howard B. Higgins
Fifth District Trustee

Robert J. Wells
Eighth District Trustee

Paul H. Jeserich
Ninth District Trustee

RESEARCH CONFERENCE

The year 1956 was described as an "epoch-making year in dental research" at a special conference on dental research October 1 in Atlantic City Auditorium.

Harry Lyons, Association president-elect and dean of the School of Dentistry, Medical College of Virginia, described the Association's long activity in furthering research, including its financing of basic investigations at the National Bureau of Standards and at the National Institutes of Health.

This year for the first time, as a result of the efforts of state, district and local societies, led by the Association, adequate federal funds are available for research, the dental educator told the conference. "These must now be put to use. Research men in this room must further the movement," he declared. "This is our challenge of the hour."

Dr. Lyons participated in a panel with Willard C. Fleming, dean of the College of Dentistry, University of California; Joseph F. Volker, dean of the School of Dentistry, University of Alabama, and Francis A. Arnold, director of the National Institute of Dental Research. Thomas J. Hill of Cleveland, a pioneer researcher in fluoridation, served as moderator.

Research was termed an "academic responsibility" by panelists Fleming and Volker. They pointed to the need to attract competent researchers to the dental school. Time must be provided during the academic day for the teacher to engage in research, they said.

Dean Fleming scored the failure of the schools to motivate young people to adopt a research career. "An atmosphere of research" in the school would aid in this respect and would also help dental graduates to evaluate research results reported in the literature, he asserted.

The dean urged that studies be carried on in both the basic and clinical sciences. "Basic research is important and essential," he said, but "it does little to advance our knowledge of treatment, control and prevention of dental disease, unless it is picked up and applied by . . . the clinical research investigator."

We will move from the stage of being able solely to care for disease, through the stage of controlling it to the stage of prevention "only through research, both basic and applied," Dean Fleming maintained.

Dr. Volker outlined the requirements for establishing a research program. Time, space and equipment, as well as competent investigators are necessary ingredients, he stated.

"Expenditure of any considerable sum of money for the support of research would need extraordinary justification unless the prerequisite trained personnel with adequate time, space and basic equipment are available," he said. "It is my personal experience that when they are, financial support is usually forthcoming."

Dr. Volker recommended teaching by the block method and the use of a split clinic as two ways of making time available for the teacher-researcher. Additionally, he recommended the development of an inservice training program and the utilizing of the graduate school as a source of research personnel.

He suggested that funds for research might be obtained from alumni organizations, local philanthropies, local and national foundations, special groups such as the cancer and heart societies and industry.

Dr. Arnold described the research program of the National Institute of Dental Research. Funds are available for research project grants and fellowships and, for the first time, for training grants to institutions and construction grants for research facilities and equipment, he said.

The importance attached by the dental profession to research was evidenced by a special research meeting held Monday, October 1. Panelists were (l. to r.): Harry Lyons, Association president-elect; Francis A. Arnold, director, National Institute of Dental Research; Willard Fleming, dean, College of Dentistry, University of California; F. Earle Lyman, chief, NIDR extramural program, and Joseph Volker, dean, School of Dentistry, University of Alabama. Thomas J. Hill, pioneer researcher in fluoridation (inset), was moderator.

The extramural research fellowship program, Dr. Arnold explained, provides stipends or awards directly to promising students who want to teach or do research. Five categories of awards are available: (1) part-time fellowship grants for students, (2) predoctoral research fellowships to support graduate training, (3) postdoctoral research fellowships for additional training, (4) fellowships for training for specific problems and (5) senior research fellowships to support preclinical science investigators between completion of training and their eligibility for permanent higher academic appointments.

Under the training grants program, schools may apply for funds to defray expenses of providing a program to train teachers and researchers and to pay them subsistence stipends, Dr. Arnold told the conference.

The various grants programs "will create a research consciousness that can have far-reaching results," he declared. "Whether we can achieve our goal depends now on men and logistics," he said.

Copies of the American Dental Association's new pamphlet *Suggestions on How To Prepare Applications for Research Grants* were made available to the conferees.

Association Affairs

SEPTEMBER MEMBERSHIP AT 86,491 SETS NEW HIGH

Association membership continued to climb to new highs as the September 30 figure reached 86,491. The total was an increase over the month previous and was 2,239 over the same date a year ago. Membership in the national group was up 5,000 over a two year period.

Included in the total were 76,509 active and life members, 9,752 student members, 198 affiliate, 17 associate and 15 honorary members. New York continued to be the largest society, with 10,700; Pennsylvania ranked second with 4,842, and Illinois third, with 4,836. Southern California, Ohio and Michigan have memberships of over 3,000.

LAUNCH GOLDEN ANNIVERSARY RELIEF FUND CAMPAIGN

The Golden Anniversary campaign of the American Dental Association's Relief Fund was launched late last month with the mailing to all members of the gold and black Relief Fund seals.

In announcing the start of the fiftieth campaign, H. R. Bleier of Milwaukee, Council chairman, stated that a national goal of $100,000 had again been set. Again this year, all funds contributed will be used for relief purposes, with the Association bearing the costs of administration, he said.

Half of all funds collected is returned to the state societies for their own funds, Dr. Bleier explained. The rest is allocated to the national fund, interest from which is used to make grants.

Societies have been divided into three groups for the purpose of the current campaign: societies with quotas over $1,000, those with quotas of $1,000 or less, and federal dental services.

The Association's Relief Fund is the indirect result of the San Francisco fire and earthquake of 1906. Dentists across the country contributed to help their colleagues in the Golden Gate City. The $4,969.75 which remained became the nucleus of the present Fund. Over one million dollars has been paid out in grants during the 50 years since 1906.

THREE LIBRARY PUBLICATIONS NOW AVAILABLE

Three publications of the Bureau of Library and Indexing Service are now available. The list, *Books and Package Libraries for Dentists,* itemizes the publications which may be borrowed from the Association's Library and includes books published between January 1950 and September 1955 and some 500 package library topics. A package library is composed of reprints and magazine clippings on a given subject.

Two library publications may be obtained from the Subscription Department at the Central Office. They are the *Index to Dental Literature* covering the period January to June 1956 and THE JOURNAL index for the same period. Subscription price for the *Index to Dental Literature* for four quarterly cumulations including the annual bound volume is $20.

SUBSCRIPTS • Effective August 1, the names of the two divisions of the Council on Dental Research are Research Division: National Bureau of Standards and Research Division: National Institutes of Health. The name Fellowship Division has been discontinued . . . Miss Helaine Levin, Association film librarian, has been re-elected vice-president of the Audio-Visual Conference of Medical and Allied Sciences.

Dental Societies

U. S. SUPREME COURT DENIES APPEAL OF LABORATORIES

The United States Supreme Court on October 15 dismissed "for want of a substantial federal question" an appeal from 24 Chicago advertising dental laboratories.

The laboratories had asked the High Court to set aside an Illinois Supreme Court ruling forbidding them from dealing directly with the public. In ruling against the laboratories, the Illinois court unanimously upheld a state law prohibiting dental laboratories and technicians from dealing with the public. The laboratory appeal to the U. S. Supreme Court was contested by the Chicago Dental Society, which had brought the original suit against them.

The October 15 order of the Supreme Court says succinctly: "The motion to dismiss is granted, and the appeal is dismissed for want of a substantial federal question."

As a result of the ruling, the Superior Court of Cook County will issue "cease and desist" orders against the laboratories.

SUBSCRIPTS • Dental societies which have announced meetings in November are the St. Louis Dental Society, which meets November 25-28 in St. Louis, and the Detroit District Dental Society, which holds its fifteenth annual dental review November 26 and 27 at the Sheraton-Cadillac Hotel in Detroit.

Over 400,000 people visited the St. Louis Dental Society exhibit at the Mid-America Jubilee on the Mississippi river front in St. Louis. The society celebrates its centennial this year. The exhibit will be at the Jefferson Hotel during the Mid-Continent Dental Congress November 25-28. In the background are (l. to r.): D. W. Brock, exhibit committee chairman; Paul A. Ebeling, president, and James E. Brophy, executive secretary, St. Louis Dental Society.

Dental Education

SURVEY PREDICTS SHORTAGE OF DENTISTS IN 11 STATES

A severe shortage of dental care will exist in 11 Western states unless they take immediate steps to train more dentists and dental hygienists, according to a survey released in mid-October. The survey was conducted by the division of dental resources of the U. S. Public Health Service, in cooperation with the Council on Dental Education of the American Dental Association, the W. K. Kellogg Foundation and the Western Interstate Commission for Higher Education.

States surveyed were Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming. Sections of Alaska and Hawaii were included also.

The study revealed that about 35,000 dentists will be needed in the Western states by 1975 to meet the higher demands for care expected by that time but that only about 16,000 dentists will be available. Thus a shortage of 19,000 dentists will exist.

Western schools must graduate 1,600 dentists a year between 1960 and 1975 to meet the needs, the report said. Currently, the region graduates 400 dentists annually.

NORTHWESTERN RECEIVES FIFTH RESEARCH GRANT

Whether cavities can be prevented by producing a highly polished protective layer on tooth enamel will be studied at the Northwestern University Dental School under a public health grant of $7,500 from the National Institutes of Health. Receipt of the grant, announced by the University in late September, brings to five the number awarded the dental school in the last few months. Eugene W. Skinner, chairman of the department of physics, is director of the study. Paul L. Copeland, chairman of the department of physics at Illinois Institute of Technology, will serve as consultant.

ROENTGENOLOGY SYMPOSIUM PLANNED BY INDIANA SCHOOL

Indiana University School of Dentistry will present a one day symposium on roentgenology November 7 in the Indiana State Board of Health Building, Indianapolis. Subjects to be discussed will be technics in intraoral and extraoral roentgenology, roentgenographic interpretation and hazards in dental roentgenology.

Panelists are Lewis B. Spear, James F. Matlock and Jack D. Carr, faculty members of Indiana University; D. T. Waggener, chairman of the department of pathology, University of Nebraska School of Dentistry, and Russell I. Todd, a private practitioner from Richmond, Ky. Dr. Todd will report the results of a dosimetry survey made in 40 dental offices.

ANNOUNCE WINTER SHORT COURSE PROGRAMS

California • A one day refresher course entitled "Periodontology for the Dental Hygienist" is offered by the University of California College of Dentistry in San Francisco December 1. Harold Ray, chairman of the division of periodontology, will be the instructor. Enrollment is limited to graduate dental hygienists.

Kansas City • Eleven courses have been announced by the University of Kansas City School of Dentistry in Kansas City, Mo. Among them are high speed technics, March 2 and 3; roentgenographic technic and interpretation, March 3; anesthesiology, February 28-March 2; office care of the handicapped child, March 1 and 2, and practice manage-

ment, March 6 and 7. Information on these and additional courses is available from the school's postgraduate division.

New York • New York University College of Dentistry in New York offers a refresher course in periodontics and oral medicine Wednesdays, February 20 through May 1. Prof. Samuel Charles Miller and associates will teach. The course will cover theoretical and practical applications of periodontal diagnosis and technics. Demonstrations on patients will be performed. Students will equilibrate the occlusion on casts.

Northwestern • Northwestern University Dental School in Chicago announces three postgraduate courses for November and December. Medical problems in dental patients will be taught November 7-9 by specialists in each related medical field to provide a survey of medical symptomatology. On December 5 and 6 a course in high speed instrumentation in operative dentistry will be presented. December 10-12 are the dates of a course in diagnosis, roentgenology and treatment planning, designed for the general practitioner.

Pennsylvania • Courses available at the School of Dentistry, University of Pennsylvania, in Philadelphia during the winter months include: crown and bridge prosthesis, January 28 to February 1; hydrocolloid indirect technic for inlays and bridges, February 16 and 17; oral diagnosis and roentgenology, January 7-18; partial dentures, February 11-16, and minor tooth movement and temporary stabilization, January 21-23.

Southern California • Four courses to be given during November and December by the University of Southern California School of Dentistry in Los Angeles are: cast inlays and single tooth restorations, November 5; increased speeds, diamond instruments and carbide burs, December 3 and 4; histopathology of the periodontium, December 10-15, and practice administration, November 17 and 18, the latter course at the Park Manor Hotel in San Diego.

Washington • A refresher course in oral roentgenology November 29 through December 2 has been announced by the University of Washington School of Dentistry in Seattle. Lloyd Jacobson, executive officer of the department of oral diagnosis and treatment planning, will teach. The practical application of oral roentgenology will be emphasized. Ten hours of clinical work are included.

TEXAS SCHOOL SCHEDULES TWO DAY SYMPOSIUM

A two day symposium on occlusion, November 22 and 23, has been announced by the Dental Branch of the University of Texas in Houston. Among the clinicians will be Harry Sicher of Loyola (Chicago) University, R. H. Kingery and R. E. Moyers of the University of Michigan, Clyde H. Schuyler of New York and Gunnar Bergstrom of Sweden, who at present is visiting professor at the Texas school.

TWO YEAR ORAL SURGERY COURSE OFFERED AT ILLINOIS

Applications are now being accepted for a two year, full-time course in oral surgery at the University of Illinois College of Dentistry. The course, which begins in September 1957, carries credit toward a Master of Science degree. Further information may be obtained from Daniel M. Laskin, department of oral and maxillofacial surgery at the school in Chicago.

OREGON SCHOOL HAS NEW BUILDING; PLANS EXPANSION

The new building of the Dental School, University of Oregon, in Sam Jackson Park, Portland, will make possible an increased undergraduate enrollment, according to a recent announcement issued by the school. Enrollment this year was nearly 300. Expansion to 320 is planned. Additionally, the postgraduate and research programs are to be enlarged.

Built and equipped at a cost of 2.6 million dollars, the structure contains 125,000 square feet of floor space. In the upper level of the rectangular section are 158 high speed dental units, chairs and cabinets, providing each upper division student with his own dental "office."

The lower level contains other clinical

The new building of the Dental School, University of Oregon, in Sam Jackson Park, Portland, was dedicated in September. The structure contains 125,000 square feet of floor space and cost 2.6 million dollars. In the background is the new teaching hospital of the medical school.

facilities. Faculty offices are in a circular section of the structure; additional laboratories, lecture rooms and the library are in the tower. Harold J. Noyes is dental school dean.

Research

RESEARCHERS ASK HELP ON DENTURE RELINERS STUDY

A request for help in a study of denture relining materials sold directly to the public was issued this month by George C. Paffenbarger, senior research associate at the American Dental Association's Research Division, National Bureau of Standards, in Washington, D. C.

Dentists are asked to send to the Research Division dentures on which such reliners were used. Information on the patient's experience with the reliner would be helpful, Dr. Paffenbarger stated.

Under study are the composition, mechanism of hardening, physical properties and the effect of the reliners on denture base materials.

Dr. Paffenbarger asked that the name of the reliner used by the patient be sent if possible. Additionally, answers are needed to the following questions. Was the patient's mucosa burned or injured by the relining material? Was the relationship between the denture and opposing teeth changed by the relining done by the patient? Was the patient pleased with the results obtained from the relining? How long did the patient wear the denture after relining it?

ANNOUNCE DECEMBER DEADLINE FOR IADR PROGRAM ITEMS

December 1 is the deadline for submitting material to be presented at the March meeting of the International Association for Dental Research, announces Edward H. Hatton, secretary-treasurer, and Dan Y. Burrill, assistant secretary-treasurer.

The IADR meets in Atlantic City, N. J., March 21-23. Its dental materials group meets March 22-24. Abstracts to

be used in the general program should be mailed to Dr. Burrill, 129 E. Broadway, Louisville 2, Ky., and to David B. Mahler, 611 S.W. Campus Dr., Portland 1, Ore., for the dental materials group program.

Abstracts entered in competition for the Edward H. Hatton Award (formerly Novice Award) should be so labeled. Inquiries on scientific exhibits may be made to William E. Hahn, The Dental School, University of Maryland, Baltimore 1, or to H. B. McCauley, City Health Department, P.O. Box 1877, Baltimore 3.

TEN GRANTS APPROVED BY ARMY DENTAL COMMITTEE

Ten research grants, three of which are renewals and seven of which are new applications, have been recommended by the Army Dental Research Advisory Committee for approval by the Surgeon General. The Committee met October 4 and 5 in Washington, D. C. Projects approved, with the three continuations listed first, are:

Development of improved methods for determination of microquantities of fluorides in biological materials, Wallace Armstrong, University of Minnesota Medical School; dietary factors responsible for the difference in cariogenicity of diets containing same amount of sucrose, John Hald and Winfrey Wynn, Emory University; studies on the solubility of certain dental materials, Ralph Phillips, Indiana University School of Dentistry; investigation of nerves and nerve endings in calcified tissue, James K. Avery, University of Michigan School of Dentistry; effects of x-irradiation during the formative period of tooth development and effect on periodontal membrane, Benjamin H. Erschoff, Western Biological Laboratories; Raman spectra of dental enamel and related substances, Robert Fischer, Indiana University School of Dentistry; accuracy of large dental castings, Eugene Skinner, Northwestern University Dental School; matrix mineral interaction in calcified tissues, Otto Trautz, New York University College of Dentistry; composition and nature of some animal mucins and glycoproteins and the relation of ascorbic acid to the ground substance and collagen of connective tissue, both projects by Ward Pigman, University of Alabama Medical Center.

AMERICAN DENTAL RESEARCH OF INTEREST TO VISITORS

Dental studies being conducted at various research centers are of interest to visitors from abroad. Recent visitors to the National Bureau of Standards in Washington, D. C., include: Ronald E. Drew, Royal Dental Hospital of London; Lars Eric Larssen, Institute of Radio Physics, Stockholm; Toshihiko Niikuni, Tokyo; Velma Peraza N., Sierra Mexico, and H. B. Tan, Minister of Health, Jakarta, Indonesia.

Visitors to the dental and oral branch of the Armed Forces Institute of Pathology in Washington, D. C., have been: C. D. Hitchins, University of St. Andrews, Scotland; Enver Eleury, Turkish Army Dental Corps; J. M. Pickard, Royal Dental Hospital, London; Michel Dechaume, Paris; Claudio Funcio Cornell, Havana; John Sciaky, Hebrew University, Jerusalem; Dr. Talantino, Philippines; Francisca Causles, Tao Baja, Puerto Rico, and Ronald Drew, Royal Dental Hospital, London.

General

CONGRESSMAN J. PERCY PRIEST, FRIEND OF DENTISTRY, DIES

Rep. J. Percy Priest of Tennessee, one of dentistry's best friends in Congress, died October 12 in Nashville, a few days after surgery for an ulcer. He was 56 years old.

As chairman of the House Committee on Interstate and Foreign Commerce, Representative Priest gave special aid to dental and other health legislation. His committee reported favorably on a bill to increase the authorization for the Na-

tional Institute of Dental Research building, on traineeship grants for postgraduate education of public health workers and on the establishment of a National Library of Medicine. Mr. Priest himself introduced bills for the library and the NIDR building.

In addition, his committee had begun a special investigation of the country's supply of physicians and dentists with a view to determining what additional aid Congress should give to increase that supply.

Representative Priest was given special commendation at the American Dental Association's annual session last month by the House of Delegates for his "valuable assistance" in securing dental research legislation.

FIRST MILLION AWARDED IN PUBLIC HEALTH TRAINING

The U. S. Public Health Service reported October 1 that almost one million dollars has been awarded to schools and individuals under the new public health training program authorized by Congress last July. Included in the list of 89 persons who received training grants directly were six dentists and five hygienists. In addition to these grants, the USPHS made grants to 41 schools for graduate training of 130 nurses in public health and 42 other students specializing in various types of public health activity.

INTERNSHIPS AVAILABLE AT ST. LOUIS JEWISH HOSPITAL

The Jewish Hospital of St. Louis is now accepting applications for its rotating dental internship for the year beginning July 1, 1957. Selections are made early in 1957 from applications on hand at that time. Information and application forms may be obtained from Robert Stone, assistant director at the hospital.

AAAS PLANS ANTIENZYMES, FORENSIC DENTISTRY FORUMS

A forum on forensic dentistry and one on antienzymes are features of the December 28 and 29 meeting of Section Nd (Dentistry) of the American Association for the Advancement of Science. All sessions will be at the Statler Hotel in New York City.

In addition to the two symposiums, six individual papers will be given, dealing with contributions of science to everyday practice. The essay program will be presided over by H. Trendley Dean, secretary of the American Dental Association's Council on Dental Research.

The symposium on forensic dentistry is cosponsored by the AAAS sections on anthropology and medical sciences. W. M. Krogman, Graduate School of Medicine, University of Pennsylvania, in Philadelphia, will preside. Moderator of the panel on antienzymes is E. F. Degering, Quartermaster Research and Development Laboratories, Natick, Mass.

George C. Paffenbarger, Senior Research Associate, American Dental Association Research Division at the National Bureau of Standards, and Earl O. Butcher, College of Dentistry, New York University, are program chairman and local chairman, respectively.

G. T. GREGORY ELECTED TO HEAD ORAL SURGEONS

G. T. Gregory of Indianapolis was elected president of the American Society of Oral Surgeons at its September 25-28 meeting in New York City. Installed as president-elect was W. T. Foster of San Antonio, Texas. Completing the roster of officers are: F. F. Pfeiffer of New York, vice-president; F. H. O'Halloran of Evansville, Ind., and E. C. Thompson of Urbana, Ill., council members, and J. R. Hayward of Ann Arbor, Mich., member of the American Board of Oral Surgery. The society's council reappointed Frank B.

Hower of Louisville, Ky., secretary-treasurer, and Miss Ruth Whalen of Richmond, Va., executive secretary.

MAJOR RICE, PRESIDENT OF COE LABORATORIES, DIES

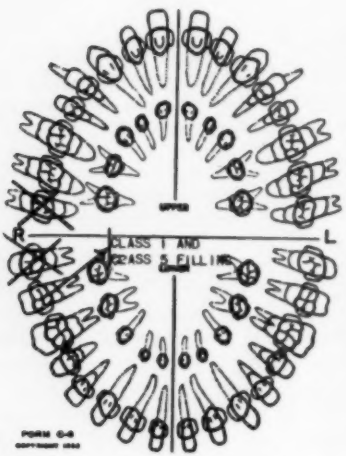
Maj. William S. Rice, president of Coe Laboratories, manufacturer of dental materials, died September 19 in Chicago after a brief illness.

Major Rice was graduated from the Ohio College of Dental Surgery, University of Cincinnati, in 1910. He served in the Army Dental Corps for 16 years and when he left the Corps, was commandant of the Army Dental School and chief of dental service, Walter Reed Hospital, Washington, D. C. He joined Coe Laboratories in 1929 as vice-president in charge of research in dental materials. In 1935 he became company president.

Major Rice

BETH ISRAEL HOSPITAL TO GIVE PERIODONTICS SEMINAR

March 11-22 are the dates of a two week seminar in periodontics scheduled by Beth Israel Hospital in Boston. Objective of the seminar is to present to the practitioner the technics and theoretical background of periodontal therapy. The material will be presented by lectures, demonstrations and clinics.



EXAMINATION CHART DATE

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ADDRESS

ELECTRO-DIAGNOSTIC TEST

REMARKS: MARKED ALVEOLAR RIDGE RESORPTION POSSIBLY DUE TO PYHORRETIC CONDITION.

ATTRITION OF UPPER AND LOWER ANTERIOR CROWNS AND MARKED OVERBITE (BUCK TEETH).

#8 UPPER RIGHT AND #8 LOWER RIGHT HAVE BEEN EXTRACTED.

#7 LOWER RIGHT HAS AN AMALGAM OCCLUSAL AND A CLASS 5 FILLING.

ALL OTHER TEETH NOT OTHERWISE INDICATED SHOW NO EVIDENCE OF DENTAL WORK.

ESTIMATE

Dentists have been asked to help identify a dead Negro found in a vacant lot in New Cassel, N. Y. The man was between 25 and 40 years of age, about 5 feet 7 inches tall, and weighed about 140 pounds. When found on August 26, he had been dead three weeks or more, victim of a homicide-gun shot. Information should be forwarded to Stuyvesant A. Pinnel, chief of detectives, Police Department County of Nassau, Mineola, N. Y.

Current Literature

A STUDY ON THE COMPATIBILITY BETWEEN ANTIBIOTICS USED IN THE TREATMENT (DISINFECTION) OF ROOT CANALS

Apostolos Al. Krikos. School of Medicine, University of Athens. 1956. (Greek with English summary.)

The compatibility of penicillin G sodium, of dihydrostreptomycin, of bacitracin and of an antiseptic (sodium benzoate and sodium caprylate) was investigated when used in various combinations, in concentrated aqueous solutions (distilled water, saline solution and broth), and in the same proportions as in Grossman's polyantibiotic paste for root canal treatment. The activity of the solutions was examined immediately after preparation and after an incubation period of ten days at 37° C.

The following observations were reported:

1. The bactericidal action of dihydrostreptomycin sulfate in freshly prepared solutions was restricted by one half by the addition of the remaining ingredients of the formula, that is, penicillin, bacitracin and sodium caprylate. It was not influenced by their presence in solutions that remained in the incubator at 37° C. for ten days.

2. A pronounced synergism between bacitracin and penicillin in freshly prepared solutions was displayed against a coagulase positive staphylococcus strain. This synergism was not weakened when the solutions also contained dihydrostreptomycin or dihydrostreptomycin plus an antiseptic.

3. After the stock solution of penicillin plus bacitracin remained in the incubator for ten days, the activity of bacitracin in the combined solution was restricted to one twentieth of the activity of the stock solution of plain bacitracin. After an initial period of synergism the activity of bacitracin was sharply reduced by the presence of penicillin, provided there was no other medicament in the solution. On the other hand, at a temperature of 37° C., the activity of bacitracin was preserved better in the stock solution of bacitracin plus dihydrostreptomycin than in the control stock solution of bacitracin.

4. At a temperature of 37° C., sodium benzoate preserved the activity of a solution consisting of dihydrostreptomycin plus bacitracin and penicillin against the bacitracin sensitive staphylococcus better than did sodium caprylate.

N. C. Hudson

JOURNAL OF DENTAL RESEARCH

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EVALUATION OF LABORATORY TESTS FOR THE ESTIMATION OF CARIES ACTIVITY

Marshall L. Snyder, Theodore Suher, Donald R. Porter, Cecil K. Claycomb and Margery K. Gardner, p. 332.

This investigation was proposed to assess the relative values of laboratory tests which use saliva for the estimation of caries activity. The incidence of caries was determined in "captive" school populations by means of semiannual clinical and roentgenographic (bitewing) examinations over a five-year period. The laboratory tests were classified as bacteriological or physico-chemical.

On grounds of applicability to large numbers of specimens, the lactobacillus count, acid production in selective media and salivary amylase tests were chosen for this study. Lactobacillus counts were made on two media, tomato-juice peptone agar at pH 5.0 (TJA) and Rogosa's SL agar (SLA). Acid production was observed in Snyder test agar (STA) and a modified SLA.

The present paper is limited to comparison of laboratory data from the bacteriological tests made on respective specimens of saliva. From the samplings from 6,455 specimens of saliva, it was determined that the lactobacillus count on TJA were quantitatively similar to those on SLA, provided the sodium azide in the TJA was reduced to a 1:20,000 concentration. The rate of acid production in STA and modified SLA at 24, 48 and 72 hour intervals was comparable in both media for all logarithmic values of lactobacillus counts on TJA or SLA.

THE INCIDENCE OF DENTAL CARIES IN ADOLESCENTS WITH DIFFERENT OCCLUSION

P. Adler, p. 344.

The incidence of dental caries as related to normalcy of occlusion or type of malocclusion

was examined in three groups of adolescents 16 to 18 years of age. The three age groups contained 3,318, 1,011 and 547 subjects of both sexes respectively. Groups of individuals with maloccluding dentitions usually display higher DMF indexes than those with normal occlusion. However, "covered" bite with normal intermaxillary molar and cuspid relationships is associated with less decay than is normal occlusion. In Class II, Division 2, malocclusion, decay is not heavier than in the normal occlusion group. This finding points to the role of hereditary factors in caries susceptibility. Dental decay is, on the other hand, an important causative factor of malocclusion, as approximately 20 per cent of malocclusion is due to the early loss of carious permanent teeth.

A SYSTEM OF CLASSIFICATION AND SCORING FOR PREVALENCE SURVEYS OF PERIODONTAL DISEASE

A. L. Russell, p. 350.

A quantitative method of scoring periodontal disease for field population studies is described. Results obtained with the scoring method used in the field are compared with group results obtained from detailed clinical procedures which include roentgenograms. The method requires a minimum of equipment. Examiners who are familiar with the criteria can report comparable results. Criteria are defined, and rationale is discussed.

USE OF EPOXY RESINS IN RESTORATIVE MATERIALS

R. L. Bowen, p. 360.

Gross or screening tests were conducted on a dental restorative material consisting of an epoxy resin with a fused silica filler. Some of the combinations had a thermal expansion equal to that of teeth, an adhesion to hard tooth tissues after immersion in water for 24 hours, a good color stability, a low solubility, a low polymerization shrinkage and an adjustable radiopacity. Further investigation is indicated.

MEASUREMENT OF THE REDUCING ACTIVITY OF HETERO AND HOMO FERMENTATIVE LACTOBACILLI

Eleanor Gilmore Schmidt and George W. Burnett, p. 370.

The reducing activity of ten heterofermentative and five homofermentative strains of lactobacilli was measured by utilizing 2, 3, 5 triphenyltetrazolium chloride (TTC) as an indicator. The degree of reduction of TTC to a red, acetone-soluble compound (formazan) by the lactobacilli was determined colorimetrically.

Factors considered in determining optimal conditions for reduction of TTC were: (1) final concentration of TTC, (2) age of test culture, (3) hydrogen ion concentration, (4) temperature of incubation and (5) buffer molarity and cell concentration. Maximal reduction occurred with the addition of 1 per cent TTC to equal volumes of 16 to 18 hour cultures and fiftieth-molar glucose, buffered with 0.2 molar buffer, pH 6.0 and incubated for 1 hour at 45° C. The minimum cell concentration, based on nitrogen content, producing discernible TTC reduction, is greater for homofermentative strains (0.08 to 0.8 mg. of nitrogen per ml.) than for heterofermentative strains of lactobacilli (near 0.01 mg. of nitrogen per ml.). It is suggested that the rate of reduction of TTC be employed as a method for differentiating homofermentative and heterofermentative lactobacilli.

THE REDUCING PROPERTY OF SALIVA TOWARD SEVERAL OXIDATION-REDUCTION INDICATOR DYES

Gordon Nikiforuk, p. 377.

TITRATABLE ACIDITY AND TITRATABLE ALKALINITY OF THE SALIVA OF CASES CHOSEN WITH REFERENCE TO DENTAL CARIES

Naomi C. Turner and John T. Anders, p. 385.

A SIMPLE, RAPID METHOD FOR QUANTITATIVE DETERMINATION OF SALIVARY AMYLASE

C. K. Claycomb, Marcia N. McChesney and Marshall L. Snyder, p. 391.

To determine if the amount of salivary alpha-amylase secreted is an index of dental decay, a simple, rapid, reproducible method of amylase analysis was developed which permitted the determination of 20 specimens an hour reported as milligrams of alpha-amylase per 0.1 ml. of saliva. In this technic, an aliquot of saliva is incubated 5 minutes with starch, and the amount of substrate remaining is determined by the color formed with iodine. No correlation was found in 1,228 specimens between salivary amylase and lactobacillus counts, acid production in selective media or volume of respective specimens of saliva.

THE EFFECTS OF PENICILLIN AND TERRAMYCIN ON DENTAL CARIES AND CERTAIN ORAL MICROFLORA IN HUNT-HOPPERT CARIES-SUSCEPTIBLE RATS

S. Rosen, H. S. Ragheb, C. A. Hoppert and H. R. Hunt, p. 399.

STUDIES ON THE ACIDURIC ORAL MICROCOCCI

H. V. Jordan, R. J. Fitzgerald and J. E. Faber, Jr., p. 404.

A total of 109 strains of aerobic, gram-positive, catalase-positive micrococci were isolated from tomato juice agar plates (pH 5.0) from the salivas of 46 of 59 adults. A study of the biochemical characteristics of these strains revealed that 16 strains from 14 individuals were typical *Micrococcus pyogenes var. aureus* (*Staph. aureus*); one strain was identified as *M. pyogenes var. albus* (*Staph. albus*). All of these strains (Group I) were coagulase-positive, gelatinase-positive and fermented mannitol. The remaining strains consisted of a group of 80 coagulase-negative micrococci (Group II) and a group of 12 strains of coagulase-negative, phosphatase-negative, tetrad-forming micrococci (Group III).

All of the coagulase-positive oral micrococci (Group I) showed acid phosphatase activity with p-nitrophenyl phosphate, phenolphthalein phosphate, or phenyl phosphate as substrates. Seventy-three of the 80 coagulase-negative oral micrococci of Group II also showed acid phosphatase activity for these three substrates, which would indicate that the phosphatase test alone is not a reliable substitute for the coagulase test. None of the micrococci showed akaline phosphatase activity at pH 8.7.

INFLUENCE OF FLUORIDES ON THE RATE OF DISSOLUTION OF THE PRINCIPAL INORGANIC ELEMENTS OF DENTIN

George W. Burnett, p. 413.

THE DISTRIBUTION OF FLUORIDE IN HUMAN ENAMEL

Finn Brudevold, Dwight E. Gardner and Frank A. Smith, p. 420.

A study has been made of the distribution of fluoride in successive layers of tooth enamel from the surface inward in deciduous teeth, in permanent unerupted and erupted teeth of different age and in teeth with mottled enamel. In all these teeth a high concentration of fluoride was found in the outermost layer of the enamel, and a low level was found in the bulk of the enamel.

The findings suggest that small amounts of fluoride are laid down in the enamel during formation and that only the outermost enamel picks up fluoride once calcification has been completed. Appreciable amounts of fluoride accumulate in the outer enamel of unerupted teeth. There also appears to be a posteruptive pickup. The outermost crystal layers of enamel may reach fluoride concentrations as great as 1 per cent.

Deciduous teeth contain less fluoride in the outer enamel than permanent teeth. Mottled enamel contains higher concentrations of fluoride than normal teeth at any distance from the enamel surface. The caries-reducing effect of fluoride is believed to be the result of the high concentration of fluoride in the surface enamel. Little protection is believed to be afforded by the low concentrations in the bulk of the enamel.

THE DISTRIBUTION OF LEAD IN HUMAN ENAMEL

Finn Brudevold and Ludville T. Steadman, p. 430.

The distribution of lead was determined in pooled ground samples of successive layers of enamel from unerupted and erupted teeth of persons of different ages. A group of mottled teeth was included also.

Lead was found to be present in the enamel of both unerupted and erupted teeth.

There was an increase in the lead concentration of the surface enamel in fully formed unerupted teeth compared to that of incompletely formed ones. The amount of lead in the outer enamel of erupted teeth was greater than that of unerupted teeth and showed an increase with age. The greatest concentration in the outermost enamel, 550 ppm, was found in the teeth of persons over 50 years old.

In all groups of teeth, the greatest amount of lead was found in the outermost enamel layer, and decreasing amounts were found in the subsurface layers until a fairly constant level was reached which represented the lead concentration in the bulk of the enamel. This concentration was about 30 ppm in teeth from young persons and about 90 ppm in teeth from persons over 50 years of age.

The lead content of the enamel of mottled teeth was less than that of normal erupted teeth, an observation which shows either that the amount of lead in the enamel may vary in different geographical regions or that the presence of fluorine in large amounts may interfere with lead uptake.

Since lead occurs in relatively high concentrations in the outer enamel, its presence may be important, but, as yet, its significance has not been established.

AMMONIA PRODUCTION IN SALIVA II.

C. T. Clegg and J. J. Rae, p. 438.

The addition of both urea and glucose to saliva in the ratio of 1:1 causes a further production of ammonia (over that obtained when urea alone is present); the pH stays above 8.0. When the urea used is less than one-tenth of the glucose, the pH drops, and if the urea used is five times the glucose, there is inhibition in ammonia production.

THE CULTIVATION OF TOOTH GERMS IN AN EMBRYO EXTRACT-FREE MEDIUM

William Lefkowitz and Patricia Swayne, p. 440.

Twenty-one tooth germs dissected from 19-day-old embryos of Rockland albino rats were cultivated in Carrel flasks; plasma and Tyrode's solution were the nutrient medium. An evaluation was made of the survival, growth and developmental potential of residual nutritional media in the explants. Comparison with results of embryo extract medium was made also. Cultivation was terminated at four day intervals up to 16 days.

In an embryo extract-free medium, the maximum growth potential achieved in four days of cultivation is equivalent to one day of *in vivo* development. Specimens taken at later periods showed increasing stages of degeneration. After eight days of cultivation, ten of the 21 explants completely degenerated in the flask, so that only 11 cultures provided tissues for histologic examination. The cells of the enamel epithelium showed greater survival than the fibroblasts of the papilla. The tooth germ explant survived, grew and developed for four days *in vitro* in the absence of embryo extract, after which degeneration occurred. Longer periods of cultivation may be attributed to embryo extract as previously reported.

AN INVESTIGATION TO DETERMINE THE EFFECTS OF STARCH SPONGE IMPLANTED IN BONE

Leo Korchin, p. 446.

Starch sponge implants were placed in the ilium and tooth extraction socket of dogs. In human subjects, the sponge was implanted in the tooth extraction socket.

In the ilium, starch sponge did not interfere with osteogenesis, but residual granules remained in the newly formed bone marrow. Degradation followed by secondary infection is presumably the cause of an acute inflammatory reaction which occurred in the dog tooth extraction socket. Delay in healing resulted. In the human tooth extraction socket, the incidence of alveolar osteitis did not increase significantly, but healing was retarded.

RESIDUAL MERCURY CONTENT OF AMALGAM RESTORATIONS AND ITS INFLUENCE ON COMPRESSIVE STRENGTH

Marjorie L. Swartz and Ralph W. Phillips, p. 458.

The method of volatilization of mercury in a nitrogen atmosphere, employed for mercury analysis of amalgam restorations, was shown to be accurate when small or unpulverized specimens were used. Analyses of 27 amalgam restorations indicated that they were not homogeneous and that residual mercury in some critical areas often approached 60 per cent. Residual mercury does vary with the original ratio and with the condensation pressure. With the two alloys used, although compressive strength was not altered appreciably by fluctuations in residual mercury content between the ranges of 50 to 55 per cent, there was a serious loss in strength when the mercury exceeded 55 per cent.

THE EFFECT OF LYMPHOCYTIC CHORIOMENINGITIS ON PREGNANCY AND DENTAL TISSUES IN MICE

Seymour J. Kreshover and James A. Hancock, Jr., p. 467.

TOOTH DEVELOPMENT AND ERUPTION. II. A BIOMETRIC ANALYSIS OF THE HISTOLOGIC RELATIONSHIP OF THE ROOT OF THE MANDIBULAR FIRST MOLAR OF THE RAT IN GROWTH AND ERUPTION TO THE LOWER BORDER OF THE MANDIBLE

Benjamin Dienstein, p. 479.

A MODIFIED GALLEGO'S IRON FUCHSIN STAIN AS A DIFFERENTIAL STAIN FOR CEMENTUM

Robert J. Levey, p. 491.

Deaths

Morey, George A., San Francisco; died April 19; aged 74.

Newman, Harry C., Beverly Hills, Calif.; University of California, College of Dentistry, 1902; died May 6; aged 77.

Nicklies, Elmer H., New Orleans; University of Iowa, College of Dentistry, 1916; died April 13; aged 66.

Ohn, Edward J., Philadelphia; University of Pennsylvania, School of Dentistry, 1921; died March 31; aged 58.

Osborn, Robert J., St. Louis; Kansas City-Western Dental College, 1927; died March 8; aged 57.

Pease, Oliver, Amesbury, Mass.; Boston Dental College, 1891; died April 8; aged 87.

PeKarna, Jules H., Austin, Minn.; University of Minnesota, College of Dentistry, 1928; died March 19; aged 54.

Perry, Lawrence C., Ypsilanti, Mich.; University of Michigan, College of Dental Surgery, 1924; died April 12; aged 58.

Plesko, John E., Scranton, Pa.; Baltimore College of Dental Surgery, University of Maryland, 1924; died April 13; aged 54.

Power, Thomas E., Westfield, Mass.; Tufts University, School of Dental Medicine, 1911; died April 22; aged 67.

Purdon, Leslie B., Mt. Sterling, Ill.; Chicago College of Dental Surgery, Loyola University, 1919; died January 24; aged 59.

Reiner, Jacob, Brooklyn; College of Dental and Oral Surgery, New York, 1913; died April 11; aged 66.

Richer, Cecil O., Portland, Ind.; Indiana Dental College, 1917; died May 19; aged 60.

Rivers, Carey E., Dubuque, Iowa; University of Iowa, College of Dentistry, 1911; died July 4, 1955; aged 68.

Roberts, Ralph L., Darien, Conn.; Washington University, School of Dentistry, St. Louis, 1932; died March 18; aged 47.

Roche, William F., Detroit; Detroit College of Medicine, Department of Dental Surgery, 1906; died April 26; aged 76.

Roche, William J., Buffalo, N. Y.; University of Buffalo, School of Dentistry, 1913; died April 7; aged 73.

Rogers, John R., Adrian, Ga.; Atlanta Dental College, 1908; died April 9; aged 71.

Rosenstein, Maurice E., Indianapolis; Indiana University, School of Dentistry, 1941; died April 6; aged 39.

Schader, Fred P., San Diego; University of Southern California, College of Dentistry, 1923; died April 13; aged 61.

Scherr, Nathan B., Baltimore, Md.; Baltimore College of Dental Surgery, University of Maryland, 1922; died March 19; aged 56.

Schmitt, John C., Louisville, Ky.; Louisville College of Dentistry of Centre College, 1914; died May 14; aged 64.

Schulman, Nathan S., Montgomery, Pa.; University of Pennsylvania, School of Dentistry, 1923; died April 3; aged 55.

Schwarz, Frederick J., Rivervale, N. J.; College of Dental and Oral Surgery, New York, 1906; died April 10; aged 79.

Schwerdtfeger, Joacim H., Bay Shore, L.I., N.Y.; New York College of Dentistry; 1907; died February 21; aged 78.

Sebora, William J., Athens, Wis.; Marquette University, Dental School, 1921; died March 5; aged 58.

Seebal, Joseph, Brooklyn; New York College of Dentistry, 1917; died March 17; aged 67.

Sheets, George E., Crafton Heights, Pittsburgh; Ohio Medical University, College of Dentistry, 1905; died April 24; aged 76.

Sheetz, William A., Nashville, Tenn.; Vanderbilt University, School of Dentistry, 1907; died January 10; aged 72.

Shelton, Charles R., Jr., Washington, D. C.; Georgetown University School of Dentistry, 1913; died June 7; aged 67.

Shipman, Elza O., Birmingham, Ala.; Southern Dental College, Atlanta, 1917; died May 18; aged 69.

Shopp, Benjamin R., Woodbury, Conn.; died April 18; aged 92.

Siegel, Benjamin, Chicago; Chicago College of Dental Surgery, Loyola University, 1918; died June 14; aged 63.

Simkins, William M., Bal Harbour, Fla.; Baltimore College of Dental Surgery, University of Maryland, 1902; died April 23; aged 78.

Simm, Fred E., Boston; Tufts University, School of Dental Medicine, 1913; died April 6; aged 74.

Smith, Dudley W., Milwaukee; Marquette University Dental School, 1933; died June 2; aged 60.

Smith, Fugh B., Coffeeville, Miss.; Atlanta Dental College, 1915; died April 6; aged 68.

Sprinkel, Alsop H., Staunton, Va.; Baltimore College of Dental Surgery, University of Maryland, 1891; died April 15; aged 87.

Steeley, Jacob O., Quakertown, Pa.; University of Pennsylvania, School of Dentistry, 1905; died April 4; aged 72.

Stover, Warren T., San Gabriel, Calif.; University of Southern California, College of Dentistry, 1911; died June 2; aged 78.

Sulecki, Charles C., Buffalo; Tufts University, School of Dental Medicine, 1928; died January 1; aged 54.

Supplee, Samuel H., Bloomfield, N. J.; University of Pennsylvania, School of Dentistry, 1928; died February 17; aged 53.

Tackney, John I., Sacramento, Calif.; University of California, College of Dentistry, 1927; died April 23; aged 53.

Taylor, Claude K., Womelsdorf, Pa.; Pennsylvania College of Dental Surgery, Philadelphia, 1897; died May 10; aged 80.

Terwilliger, Kenneth F., San Francisco; University of California, College of Dentistry, 1919; died May 20; aged 61.

Thomas, George P., Nesquehoning, Pa.; University of Pennsylvania, School of Dentistry, 1916; died April 4; aged 61.

Tucker, Eldo G., Cook, Neb.; University of Nebraska College of Dentistry, 1918; died May 14; aged 64.

Turlington, Roscoe A., Clinton, N. C.; Baltimore College of Dental Surgery, 1913; died December 29, 1955; aged 68.

Vincent, Burnell W., Norfolk, Va.; Kansas City-Western Dental College, 1934; died February 24; aged 48.

Voorhies, Clayton A., Lafayette, La.; Loyola University, School of Dentistry, New Orleans, 1927; died May 18; aged 54.

Walling, Myron B., Chicago; Northwestern University Dental School, 1920; died June 18; aged 65.

Walling, W. A., Chaffee, Mo.; Barnes Dental College, St. Louis, 1909; died December 20, 1955; aged 76.

Ward, Claude A., Fort Worth, Texas; Louisville College of Dentistry of Centre College, 1905; died Feb. 29; aged 74.

Watson, James W., Santa Rosa, Calif.; Baltimore College of Dental Surgery, University of Maryland, 1892; died June 21, 1955; aged 84.

Weaver, J. Ward, Pleasantville, N. J.; Temple University, School of Dentistry, 1925; died March 25; aged 52.

Weaver, Samuel Marshall, Cleveland, Ohio; Western Reserve University, College of Dentistry, 1899; died Feb. 12; aged 80.

Webb, Harry C., Syracuse, N. Y.; University of Buffalo, School of Dentistry, 1896; died April 11; aged 80.

Welcher, David M., Chicago; Northwestern University Dental School, 1911; died April 28.

Welkowitz, Harold, West Brighton, N. Y.; New York College of Dentistry, 1918; died May 28; aged 60.

Wells, Frank M., Cedar Rapids, Iowa; Chicago College of Dental Surgery, Loyola University, 1902; died April 22, 1955; aged 81.

Wenker, Gilbert I., Milwaukee; Milwaukee Medical College, Dental Department, 1900; died October 22, 1955; aged 76.

Wheeler, Raymond E., Duluth, Minn.; Northwestern University, Dental School, 1911; died April 9; aged 69.

White, George W. E., Selma, Calif.; University of Southern California, College of Dentistry, 1918; died March 15; aged 59.

White, William D., New York; died April 13; aged 81.

Wicklin, Charles S., Chicago; Northwestern University Dental School, 1898; died May 5; aged 86.

Wight, Royal E., Salt Lake City; University of Pennsylvania, School of Dentistry, 1901; died April 26; aged 76.

Wigle, Arundel B., Detroit; Detroit College of Medicine, Department of Dental Surgery, 1907; died Feb. 22; aged 78.

Wilson, Robert B., La Jolla, Calif.; University of Minnesota, College of Dentistry, 1900; died Jan. 16; aged 84.

Wilson, William D., Winfield, Iowa; University of Iowa, College of Dentistry, 1918; died Jan. 20; aged 58.

Winchester, Walter F., Brookline, Mass.; Boston Dental College, 1906; died March 28; aged 81.

Wisner, George N., San Jose, Calif.; Western Reserve University, College of Dentistry, 1917; died March 30; aged 64.

Witten, Ralph, San Fernando, Calif.; St. Louis University, School of Dentistry, 1924; died March 19; aged 57.

Wolfe, Lawrence L., Butler, Ind.; Indiana University, School of Dentistry, 1927; died March 7; aged 50.

Wolkow, Henry E., St. Paul, Minn., Northwestern University Dental School, 1903; died January 17; aged 75.

Womack, Edward A., Cleveland; Western Reserve University, College of Dentistry, 1904; died March 30; aged 72.

Woodward, Irving B., Denver; Colorado College of Dental Surgery, 1901; died April 21; aged 79.

Worden, Egbert A., Janesville, Wis.; Milwaukee Medical College, Dental Department, 1903; died April 9; aged 80.

Yates, D. Mayfield, Roanoke, Ala.; Atlanta Dental College, 1896; died November 29, 1955; aged 84.

Zachary, James F., Brevard, N. C.; Atlanta-Southern Dental College, 1919; died January 14; aged 63.

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Announcements

MEETINGS OF THE AMERICAN DENTAL ASSOCIATION

Ninety-Eighth Annual Session	Nov. 4-7, 1957	Miami, Fla.
Ninety-Ninth Annual Session	Nov. 10-13, 1958	Dallas, Texas
One-Hundredth Annual Session	Sept. 21-24, 1959	New York
One-Hundred and First Annual Session	Oct. 17-20, 1960	Los Angeles

MEETINGS OF CONSTITUENT SOCIETIES

State	Date	Place	Secretary	Address
Alabama	Apr. 16-18, 1957	Birmingham	F. A. Finney, Jr.	Box 787, Gadsden
Alaska			C. L. Polley	Box 1896, Juneau
Arizona	May 1-4, 1957	Chandler	W. G. Burke	17 E. Weldon Ave., Phoenix
Arkansas	Apr. 7-10, 1957	Little Rock	D. M. Hamm	Box 89, Clarksville
California	Apr. 15-17, 1957	San Francisco	W. J. Healy	450 Sutter St., San Francisco
S. California	Apr. 7-10, 1957	Los Angeles	S. M. Silverman	903 Crenshaw Blvd., Los Angeles 19
Colorado			W. R. Humphrey	Republic Bldg., Denver
Connecticut	May 15-17, 1957	Hartford	E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware	Jan. 1957		J. C. Gantt	1102 N. Jackson, Wilmington
District of Columbia	Mar. 10-13, 1957	Washington	J. F. Keaveny	1029 Vermont Ave., N.W., Washington
Florida	Apr. 15-17, 1957	St. Petersburg	W. C. Mayo	Brent Annex, Pensacola
Georgia			J. W. Yarbrough	Southern United Bldg., Macon
Hawaii			J. H. Dawe	810 N. Vineyard St., Honolulu
Idaho			M. R. Johnson	1606 E. Center St., Pocatello
Illinois	May 12-15, 1957	Peoria	P. W. Clopper	Jefferson Bldg., Peoria
Indiana	May 20-22, 1957	Indianapolis	W. R. Shoemaker	Citizens Bank Bldg., Anderson
Iowa	May 5-8, 1957	Des Moines	H. L. Wilson	Insurance Exchange Bldg., Des Moines
Kansas	May 13-16, 1957	Wichita	F. A. Richmond	Brotherhood Bldg., Kansas City 1
Kentucky	Mar. 31-Apr. 3, 1957	Louisville	A. B. Coxwell, Jr.	1976 Douglass Blvd., Louisville
Louisiana	Apr. 24-27, 1957	Lake Charles	J. S. Bernhard	2515 Line Ave., Shreveport
Maine			S. M. Gower	Box 27, Skowhegan
Maryland	May 5-8, 1957	Baltimore	C. L. Inman, Jr.	Medical Arts Bldg., Baltimore
Massachusetts	May 5-8, 1957	Boston	H. E. Tingley	12 Bay State Rd., Boston 15
Michigan	Apr. 8-10, 1957	Detroit	F. Wertheimer	Michigan Dept. of Health, Lansing
Minnesota	Apr. 1-3, 1957	Minneapolis	C. V. E. Cassel	Hamm Bldg., St. Paul
Mississippi	Apr. 28-May 1, 1957	Jackson	B. A. Cohen	Plaza Bldg., Jackson 27
Missouri	May 26-29, 1957	St. Louis	E. D. Suggett	Merchants Bank Bldg., Jefferson City
Montana			E. G. Vedova	Box 311, Roundup
Nebraska	Apr. 29-May 1, 1957	Lincoln	F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada	May 5-7, 1957	Las Vegas	O. M. Seifert	755 Ryland Ave., Reno
New Hampshire	June 16-19, 1957	Whitefield	F. E. Williams	814 Elm St., Manchester
New Jersey	May 12-15, 1957	Atlantic City	J. G. Carr	407 Cooper St., Camden
New Mexico	May 19-22, 1957	Albuquerque	J. S. Eilar	7 Medical Arts Sq., N.E., Albuquerque
New York	May 20-22, 1957	New York	C. A. Wilkie	1 Hanson Pl., Brooklyn
North Carolina	May 5-8, 1957	Pinehurst	L. H. Butler	Jefferson Bldg., Greensboro
North Dakota	Apr. 28-May 1, 1957	Fargo	J. H. Pfister	419½ Dakota Ave., Wahpeton
Ohio			E. G. Jones	185 E. State St., Columbus
Oklahoma	Apr. 14-17, 1957	Tulsa	S. A. Russman	1219 Classen Dr., Oklahoma City

State	Date	Place	Secretary	Address
Oregon	Mar. 4-6, 1957	Portland	T. D. Holder	Selling Bldg., Portland
Panama Canal Zone	Apr. 4, 5, 1957	Albrook A.F.B.	A. L. Robertson	5700 USAF Dispensary, Albrook Air Force Base
Pennsylvania	May 23-25, 1957	Harrisburg	M. D. Zimmerman	217 State St., Harrisburg
Puerto Rico	Nov. 25	San Juan	R. Carrasquillo	P. O. Box 214, De Diego #3 Rio Piedras
Rhode Island	Jan. 22, 23, 1957	Providence	J. S. Allen	Union Trust Bldg., Providence
South Carolina	May 12-14, 1957	Myrtle Beach	J. E. Wallace	1420 Gregg St., Columbia
South Dakota	May 12-14, 1957	Watertown	R. E. Decker	Box 308, Parker
Tennessee	May 13-16, 1957	Gatlinburg	A. M. Ballentine	215 W. Flower St., Pulaski
Texas	Apr. 28-May 1, 1957	Houston	W. Ogle	3707 Gaston Ave., Dallas 10
Utah	May 23-25, 1957	Salt Lake City	R. C. Dalgleish	State Capitol Bldg., Salt Lake City
Vermont	May 26-28, 1957	Manchester	E. H. Van Santvoord	22 Washington St., Rutland
Virginia	Apr. 29-May 1, 1957	Virginia Beach	W. T. McAfee	Colonial National Bank Bldg., Roanoke
Washington	Apr. 1-3, 1957	Seattle	J. M. Deines	Medical & Dental Bldg., Seattle
West Virginia	July 21-24, 1957	White Sulphur Springs	G. N. Casto, Jr.	3820 McCorkle Ave., S.E., Charleston
Wisconsin	Apr. 29-May 1, 1957	Milwaukee	H. O. Hoppe	1331 W. Vliet St., Milwaukee
Wyoming	June 1957	Sheridan	T. J. Drew	State Office Bldg., Cheyenne

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Alabama	June 6-14* June 10, 11,† 1957	Birmingham	W. L. McCarty	Professional Bldg., Montgomery
Alaska			R. H. Williams	Box 2122, Juneau
Arizona			W. G. Biddulph	1502 W. Osborn Rd., Phoenix
Arkansas			W. T. Jones	107 E. Shelton, Monticello
California	Jan. 28-Feb. 2, 1957	San Francisco	T. G. Atwood	450 Sutter St., San Francisco
	June 24, 1957	Los Angeles		
	July 29, 1957	San Francisco		
Colorado			R. F. Gilmore	Republic Bldg., Denver
Connecticut			C. G. Brooks	302 State St., New London
Delaware			P. K. Musselman	143 W. Main St., Newark
District of Columbia			W. T. Birthright	1835 Eye St., N.W., Washington
Florida	July 8-18, 1957*†	Jacksonville	R. P. Taylor, Jr.	P. O. Box 2913, Jacksonville 3
Georgia			W. G. Brown	Blackshear
Hawaii			H. L. Houvener	Dillingham Bldg., Honolulu
Idaho	June 24-26, 1957	Boise	A. G. DeWinter	Sun Bldg., Boise
Illinois	Nov. 27-30‡		W. A. McKee	Wood Bldg., Benton
Indiana	Nov. 5-8*†	Indianapolis	C. A. Frech	Gary National Bank Bldg., Gary
Iowa	May 27-31, 1957*†	Iowa City	P. A. Hahn	Farmers & Merchants Bank Bldg., Burlington
Kansas			G. L. Teall	Box 71, Hiawatha
Kentucky			J. J. Kelly	102 W. Madison St., Franklin
Louisiana			R. C. Steib	Maison Blanche Bldg., New Orleans
Maine			A. S. Appleby	Box 260, Skowhegan
Maryland	Nov. 12-14‡ June 10-12, 1957‡		H. Levin	3429 Park Heights Ave., Baltimore 15
Massachusetts			T. J. Glennon	323 Main St., Woburn
Michigan	Jan. 13-19, 1957	Detroit	J. L. Champagne	3714 W. McNichols Rd., Detroit 21
	June 9-15, 1957	Ann Arbor		
Minnesota	Jan. 7-11, June 17-21, 1957*†	Minneapolis	M. G. Walls	Lowry Bldg., St. Paul
Mississippi	Jan. 3-5, June 18-20, 1957*†	Jackson	J. C. Boswell	Medical Arts Bldg., Jackson

State	Date	Place	Secretary	Address
Missouri			R. R. Rhoades	Central Trust Bldg., Jefferson City
Montana			R. O. Betzner	303 Power Block, Helena
Nebraska			H. E. Weber	Federal Securities Bldg., Lincoln
Nevada			A. A. Cozzalio	130 N. Virginia, Reno
New Hampshire			S. G. Markos	8 Renaud Ave., Dover
New Jersey			C. J. Schweikhardt	20 Durand Rd., Maplewood
New Mexico			J. J. Clarke, Sr.	Artesia
New York	Feb. 5-8*‡ Feb. 5, 6†‡ June 25-28*‡ June 25, 26†‡ Dec. 10-13,*‡ 1957		D. W. Beier	23 S. Pearl St., Albany 7
North Carolina	June 24,*† 1957	Chapel Hill	J. H. Guion	Doctors Bldg., Charlotte 7
North Dakota			T. M. Flath	Williston
Ohio			H. B. Smith	322 E. State St., Columbus 15
Oklahoma			W. E. Cole	2420 N. Meridian, Oklahoma City
Oregon	Dec. 3-5*†	Portland	F. L. Utter	Pioneer Trust Bldg., Salem
Pennsylvania			A. M. Stinson	Dept. of Public Instruction, Box 911, Harrisburg
Puerto Rico			J. Mercado C.	Comercio St. #452, San Juan
Rhode Island			F. M. Hackett	267 Academy Ave., Providence
South Carolina			J. L. Gunter	1226 Pickens St., Columbia 1
South Dakota			H. T. Aker	Canton
Tennessee	Dec. 10-14‡		C. R. Aita	Bennie-Dillon Bldg., Nashville
Texas			R. T. Weber	Capital National Bank Bldg., Austin 16
Utah	June 24-30, 1957‡		A. Ridge, Jr.	10 S. Second E., Provo
Vermont			P. M. Fitch	Newport
Virginia	June 10-15* June 10, 11,† 1957	Richmond	J. M. Hughes	Medical Arts Bldg., Richmond
Washington	Jan. 14-17, 1957	Seattle	R. W. Frick	P. O. Box 308, Pomeroy
West Virginia	June 24-26, 1957	West Liberty	C. C. Cottrill	Box 111, Glen Rogers
Wisconsin			S. F. Donovan	Tomah
Wyoming			W. A. Hocker	O & S Bldg., Casper

Most states require applications to be in 30 days prior to examination date.
*Dental examination. †Dental hygiene examination. ‡Write to secretary of dental examining board for information on locations of examinations.

MEETINGS OF OTHER ORGANIZATIONS

Name	Date	Place	Secy. or Chm.	Address
American Academy of Dental Medicine	Dec. 2	New York	G. J. Witkin Secy.	45 S. Broadway, Yonkers 2, N.Y.
American Academy of Maxillofacial Prosthetics	Jan. 31-Feb. 2, 1957	Chicago	A. H. Bulbulian Pres.	Mayo Clinic, Rochester, Minn.
American Association for the Advancement of Science, Section on Dentistry	Dec. 28, 29	New York	R. W. Bunting Secy.	School of Dentistry, University of Michigan, Ann Arbor, Mich.
American Association of Endodontics	Feb. 2, 3 1957	Chicago	V. B. Milas Secy.	2559 W. 63rd St., Chicago 29
American Board of Pedodontics	July 25-27, 1957	San Francisco	R. L. Ireland Secy.	College of Dentistry, University of Nebraska, Lincoln 8, Neb.
American Equilibration Society	Feb. 1, 1957	Chicago	C. Perry Secy.	16350 E. Warren Ave., Detroit 24
American Institute of Dental Medicine	Nov. 4-8	Palm Springs, Calif.	M. Lewis Exec. Secy.	2240 Channing Way, Berkeley 4, Calif.
American Public Health Association, Inc.	Nov. 12-16	Atlantic City, N.J.	R. M. Atwater Exec. Secy.	1790 Broadway, New York
Chicago Dental Society	Feb. 3-6, 1957	Chicago	K. S. Richardson Exec. Secy.	30 N. Michigan Ave., Chicago
Cincinnati Dental Society	Mar. 17-19, 1957	Cincinnati	H. G. Frankel Chm.	Doctors Bldg., Cincinnati

Name	Date	Place	Secy. or Chm.	Address
Council on Dental Education, Dental Aptitude Tests	Jan. 18, 19, 1957		S. Peterson Secy.	222 E. Superior St., Chicago
Denver Dental Association	Jan. 6-9, 1957	Denver	E. T. Klein Secy.	Republic Bldg., Denver
Detroit District Dental Society, Fifteenth Annual Dental Review	Nov. 26, 27	Detroit	A. H. Grob Pub. Chm.	11751 Grand River, Detroit 4
Greater New York Dental Meeting	Dec. 3-7	New York	R. E. Morse Gen. Chm.	Hotel Statler, New York 1
Greater Philadelphia Annual Meeting	Mar. 26-29, 1957	Philadelphia	H. Silver Exec. Secy.	Bellevue-Stratford Hotel, Broad and Walnut Sts., Philadelphia 2
International Association for Dental Research	Mar. 21-24, 1957	Atlantic City, N.J.	D. Y. Burrill Asst. Secy.	129 E. Broadway, Louisville 2, Ky.
International Dental Congress	June 1-9, 1957	Turin, Italy	B. Roccia Dir.	Dentistry Clinic, University of Turin, Corso Polonia 2, Italy
Japan Dental Association, Biennial National Meeting	Apr. 28-30, 1957	Tokyo	T. Kashima Dir.	1-Chome, Ogawa-machi, Kanda, Tokyo, Japan
Mid-Continent Dental Congress and Centennial Meeting of the St. Louis Dental Society	Nov. 25-28	St. Louis	J. E. Brophy Exec. Secy.	8013 Maryland Ave., St. Louis 5
National Board of Dental Examiners	Dec. 3, 4		G. J. Casey Secy.	222 E. Superior St., Chicago
New Orleans Dental Conference	Nov. 11-14	New Orleans	B. G. Frick, Jr. Secy.	Maison Blanche Bldg., New Orleans 16
Ninth District Dental Society of Montana	Jan. 17-19, 1957	Billings, Mont.	C. H. Betzer Secy.	1125 Poly Dr., Billings, Mont.
Pan American Odontological Association	Dec. 5	New York	R. H. Brodsky Exec. Secy.	14 E. 81st St., New York
Thirtieth Journees Dentaires Internationales de Paris	Nov. 26-Dec. 2	Paris, France	P. Coustaing Secy. Gen.	50, rue Pierre Charron, Paris, France

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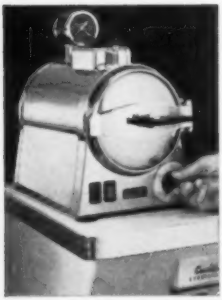

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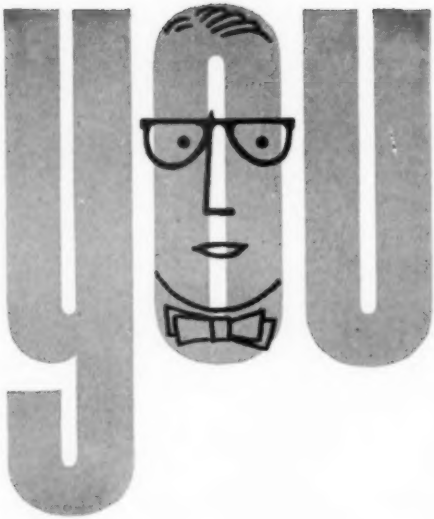

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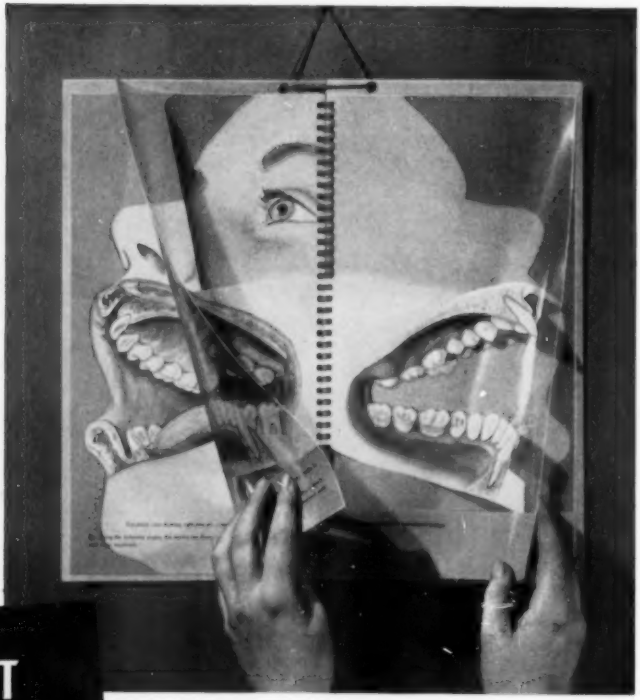

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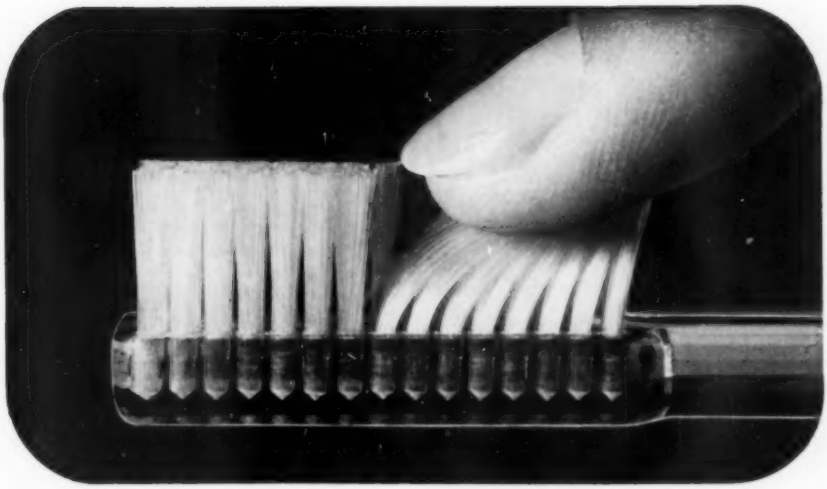

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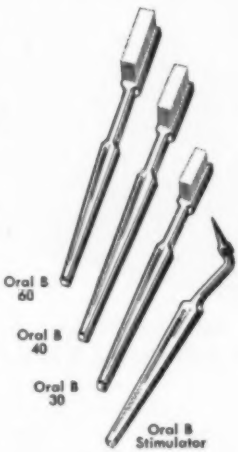

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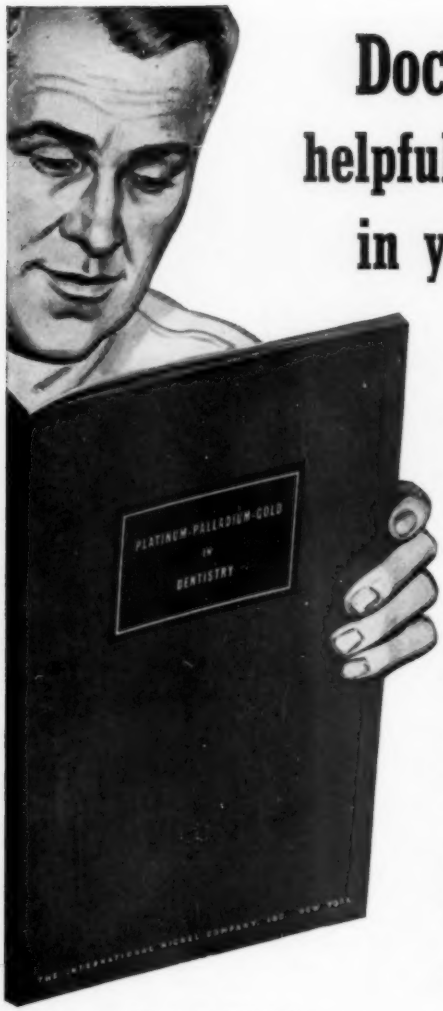

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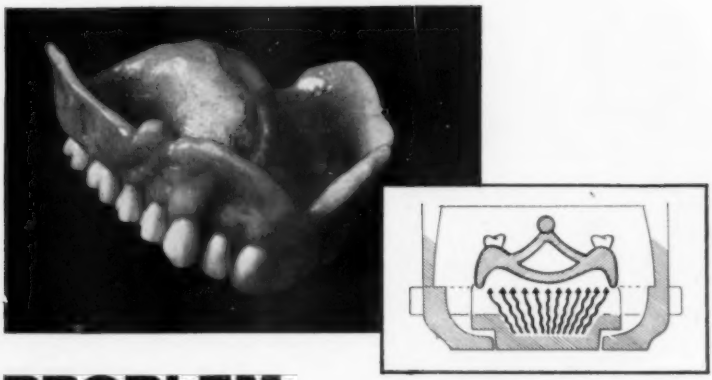

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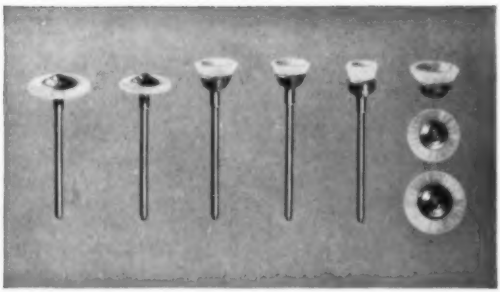

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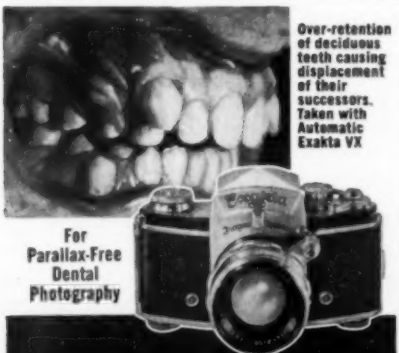

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1. Watt, B.K., and Merrill, A.L.: Composition of Foods—Raw, Processed, Prepared—Washington, D.C., United States Department of Agriculture, Agricultural Handbook No. 8, 1950.

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CALIFORNIA—Oral surgeon planning retiring in near future desires associate to take over established practice in southern California. Will remain with new man sufficient time to give security and confidence. Address A.D.A. Box No. 467.

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GEORGIA—Wanted, dentist to join two others in group practice. Established ten years. Start immediately. No investment needed. Medium sized town in western Georgia. Address A.D.A. Box No. 445.

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IDAHO—New modern medical clinic has room for a young dentist. Town of 14,000, home of College of Idaho. Excellent hunting and fishing, and congenial group to work with, consisting of two M.D.s and a chiropodist. Seven dentists in town now. Large ranching and dairy area to draw from. growing rapidly. Good opportunity. Contact Dr. Distler, Caldwell, Idaho.

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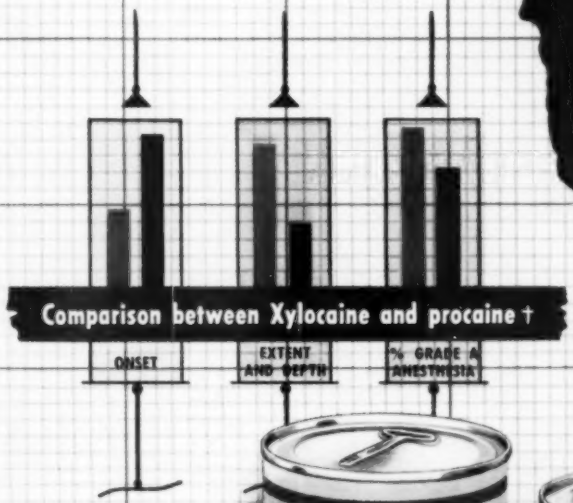

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†Huldt, S., "Factors Influencing the Efficiency of Dental Local Anesthetics in Man", Acta Odontologica Scandinavica, Volume 11, Supplement 13, 1953.

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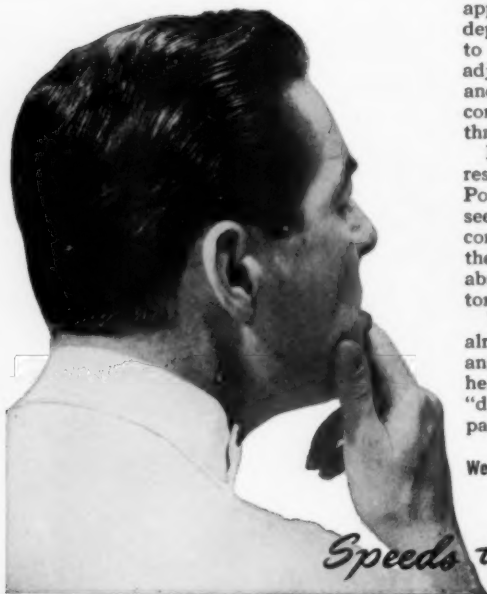

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• • •

The Arabs of the first century A. D. were strongly averse to bloody operations. Following the teachings of such Arab physicians as Avicenna (930-1037), whose Canon of Medicine served as a standard text in European universities until the 17th century, the Arabs had one preferred treatment for every painful tooth—to shake it! Only if a stubborn tooth refused to respond to a thorough shaking would they, as a last resort, drill it, fill it—and hope for the best.

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One of the oddest victims of "guilt by association" was dental amalgam, over which a bitter "Amalgam War" was waged in this country from 1835 to 1850. Because of the unscrupulous practices employed by the Crawcour brothers in introducing amalgam here from France in 1833, its use was publicly denounced as malpractice by the American Society of Dental Surgeons in 1843. Amalgam's true virtues eventually were recognized, and the action of the Society was rescinded in 1850.

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In India some three or four thousand years B.C. was written the Ayurveda—one of the 100 or more extant Vedas—the "five-foot shelf" of the most ancient sacred literature of the Hindus. In this work, with its fascinating revelation of ancient Indian medicine and dentistry, are reported the use of instruments for tooth extraction that are surprisingly modern in design. Today, India makes a significant contribution to the modern post-extraction problem as well: it provides its forest product Gum karaya, used as the basic ingredient in Wernet's Powder.

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APRIL 28-29-30, 1957

TOKYO

The Board of Trustees of the American Dental Association has accepted an invitation from Dr. T. Kashima, Managing Director of the Japan Dental Association, for American essayists and clinicians to participate in their national convention in Tokyo next April. One complete day of the three day meeting is being turned over exclusively to the dentists from the United States.

Only 40 essayists and clinicians, plus a small number of other dentists who may not wish to make presentations, will be accepted in this group. Interested dentists should apply immediately

The entire program including transportation, hotels, sightseeing, receptions, is being handled by the Institute of Pacific Seminars, the coordinating office in California which is responsible for all the arrangements involving American dentists and their families.

Besides the professional attractions of the program, numerous social and personal events are being arranged jointly by the Japan Dental Association and Institute of Pacific Seminars especially for this group.

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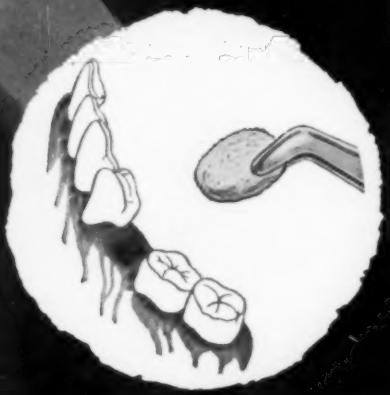

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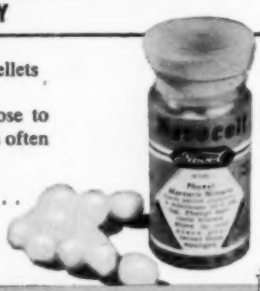

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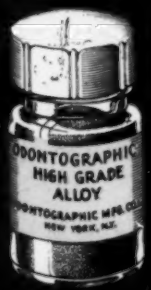

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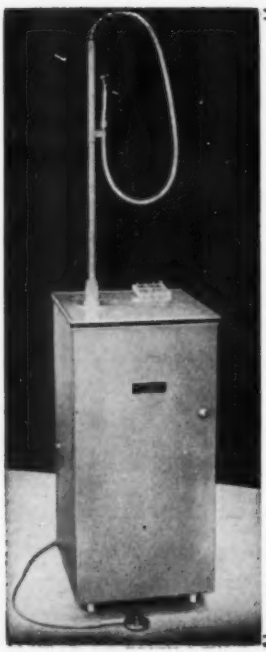

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*JADA Vol. 47, P. 324-329, Sept. 1953. NELSEN, R. J., D.D.S.; PELANDER, C. E.; KUMPULA, J. W.: Hydraulic Turbine Contra Angle Handpiece. (Reprint on request)

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1. Zach, L., and Brown, G. N.: N.Y. State D.J., Jan. 1956
2. Friedman, J., Lite, T. and Solomon, H.: N.Y.J. Den., Apr. 1956
3. Van Huysen, G., Healey, H. and Patterson, S.: U.S.A.F. Med. J., May 1956
4. Butt, B., Harris, N., Shannon, I. and Zander, H.: I.A.D.R. Abstracts, No. 34, 1956
5. Zinner, D., and Whetstone, W.: J. Den. Child., Mar. 1956

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San Francisco 22, California

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Los Angeles 7, California

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Loyola University
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Chicago 12, Illinois

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Northwestern University
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University of Louisville
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1. Bowes, A. deP.: Dietotherapy—Nutrition of Children During Their School Years, Am. J. Clin. Nutrition *3*:254 (May-June) 1955.
2. Sebrell, W. H., Jr.: Trends and Needs in Nutrition, J.A.M.A. *152*:42 (May 2) 1953.
3. Council on Dental Health, American Dental Association, 'The Care of Children's Teeth,' in Your Child's Teeth—Questions and Answers, 1954, p. 14.

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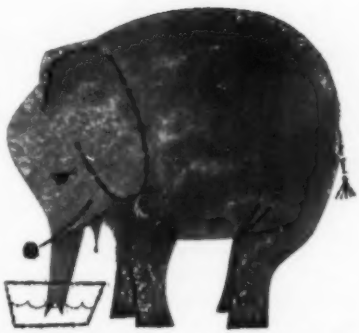

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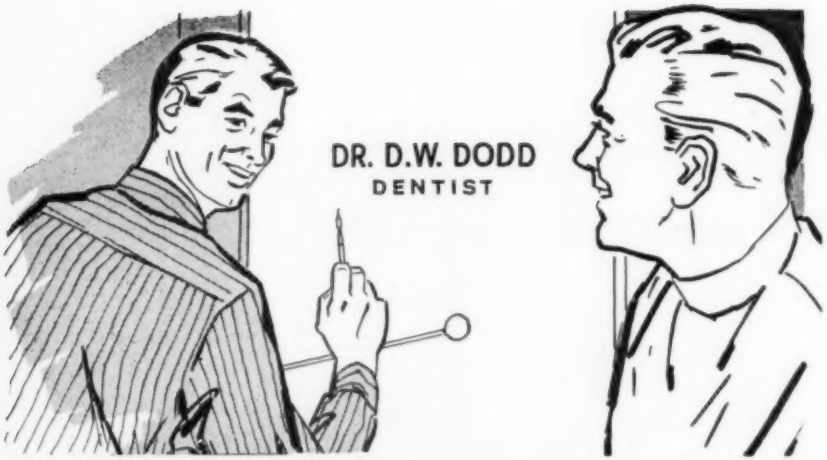

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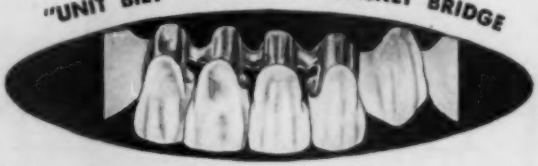

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$ave $2.30

or as many times $2.30 as you like

For a limited time only, a *BONUS* ounce of Cresilver will be delivered (*without extra charge*) with every five ounces you buy! This means a saving of $2.30. If you buy ten ounces of Cresilver, you get 2 extra ounces, and save twice $2.30 or $4.60. Your saving is limited only by the number of five ounce bottles of Cresilver you order. This offer, however, must be limited for obvious reasons (such as rising costs) for 60 days.

Users of Cresilver are familiar with the many qualities of this outstanding alloy. They know it contains 74½% silver—the highest practical silver content of any alloy available anywhere. You, too, will like its smooth amalgamating qualities, its fine texture, its lasting lustre. Check your alloy needs today and decide how much you would like to save.

BONUS!

MAIL THE COUPON TODAY

and with your free ounce of Cresilver we'll also send without charge a ½ dozen Crescent Improved Polishing Brushes, and a package of Crescent Amalgam Polish

CRESCENT DENTAL MFG. CO.
1839 S. Pulaski Road, Chicago 23, Illinois

☐ Send promptly, delivery charges prepaid, 5 ounces of Cresilver for $11.50, *plus the Bonus ounce without extra charge.*

☐ Send 10 ounces for $23.00, *plus 2 Bonus ounces without extra charge.*

☐ Send 25 ounces for $57.50, *plus 5 Bonus ounces without extra charge.*

☐ _____

DOCTOR _____

ADDRESS _____

MY DEALER IS _____

☐ Charge thru dealer.
☐ Enclosed find check or money order for $____
☐ Send C.O.D. for $____
In any case, please be sure to give dealer's name.

PAGE Chayes HIGH SPEED CONTRA ANGLE

NO GEARS. FULLY BELT DRIVEN. ELIMINATES VIBRATION, WEAR AND LUBRICATION PROBLEMS WHICH ARE UNAVOIDABLE IN CONVENTIONAL GEAR DRIVES.

EQUIPPED WITH OWN WRIST JOINT, WHICH ATTACHES TO ARM OF ANY DENTAL ENGINE.

SIMPLE, EASILY CHANGED RUBBER CHUCK HOLDS BUR AND CUSHIONS IT AGAINST VIBRATION.

COMPLETE SET INCLUDES:
1 Page-Chayes Contra Angle, Model X-1 (for dual control) • 1 Air Filter and Valve Unit • 12 Carbide Burs • 12 Mounted Points • 6 Rubber Chucks • 1 Chuck Insertion & Removal Tool • Plastic Tongs • Tubing and Fittings for connection to Thermex Dual Control.

$300 Complete

Model X-2, for use with Fluidair (Ritter) and Tri-Jet (Hanau) complete with necessary connections, and accessories as above.

$335 Complete

1 VIBRATIONAL FREQUENCY BEYOND PATIENTS' SONIC THRESHOLD

Higher speeds with rotary instruments are a material aid in the control of trauma.

Clinical work indicates that somewhere between 90,000 and 100,000 RPM the patient loses ability to tell when tooth structure is being cut. At these speeds, the patient is vibrationally unaware of cavity preparation.

2 UNBELIEVABLE FREEDOM OF CUT

All who have used the Page-Chayes have been impressed by the ease with which difficult cavity preparations are accomplished . . . a result of the unbelievable freedom of cut which this instrument affords. The bur, running at these speeds, may be laid on the margin without any tendency to jump.

3 GREATER CONTROL THAN EVER BEFORE

The Page-Chayes Contra Angle provides a heretofore unobtainable "control". The Page-Chayes lets you operate with a "light as a feather" touch . . . lets the instrument do the work—resulting in more accurate cavity preparation with increased efficiency and less fatigue. Only 2 to 4 ounces of pressure is required.

Literature and reprints upon request.

Chayes

DENTAL INSTRUMENT CORP.

460 WEST 34TH STREET NEW YORK 1, N. Y.

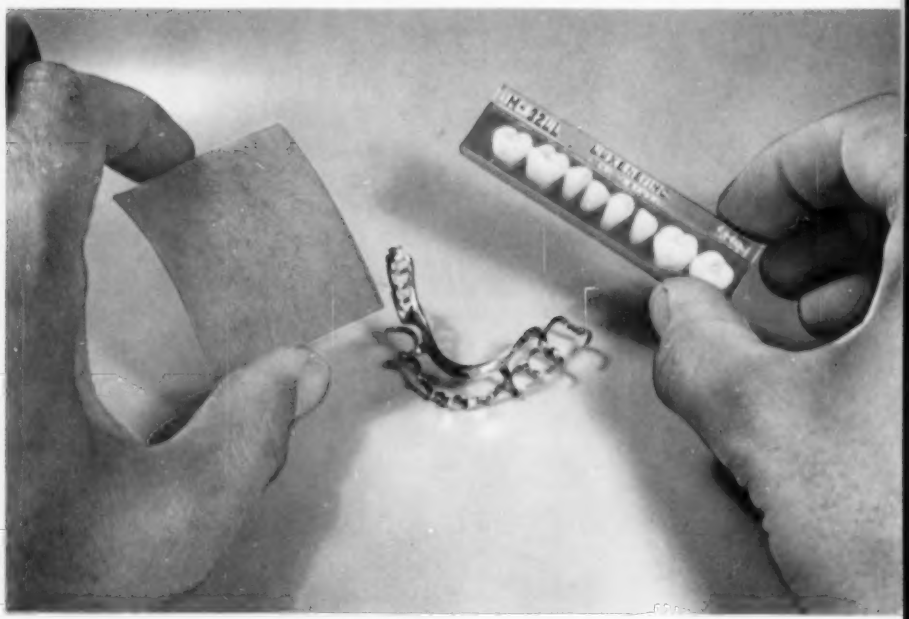
IN NATURE WE FIND PEACE OF MIND

The complete story is in the following pages.

IT TAKES ALL FOUR,

PLUS ONE THING MORE . . .

TO MAKE YOUR PARTIAL DENTURES SCORE!



Providing the impression is accurate and the stone model properly mixed and poured, you can be completely assured that

1. The metal skeleton will fit the original model.
2. Luxene attachments will not break away.
3. Luxene teeth are cured to the base and they do not crack or craze.
4. Clinical records reveal unusually high resistance to abrasion and complete compatibility with natural teeth.
5. *Plus one thing more* . . . Skilled hands — with natural ability, experience and a desire to serve.

THE ALL LUXENE 44 C-TONE DENTURE

Oral pathologists from several prominent universities say after examining many different samples that the C-Tone effect produced by fibres incorporated in Luxene 44 — reproduces natural gum tissue and matches nature with great fidelity.

These same authorities have commented on Luxene teeth. They say the ability to absorb light like natural teeth provides a great step forward in the attempt to match the appearance of natural teeth under all light conditions.

The chemical combination of Luxene 44 and Luxene teeth results in a practical denture that provides a sanitary feature not possible when porcelain teeth are used.

PUBLISHED ON BEHALF OF LUXENE SELECTED LABORATORIES

EACH LUXENE

LABORATORY ACCOMPLISHES

THE DOCTOR'S GOAL BY

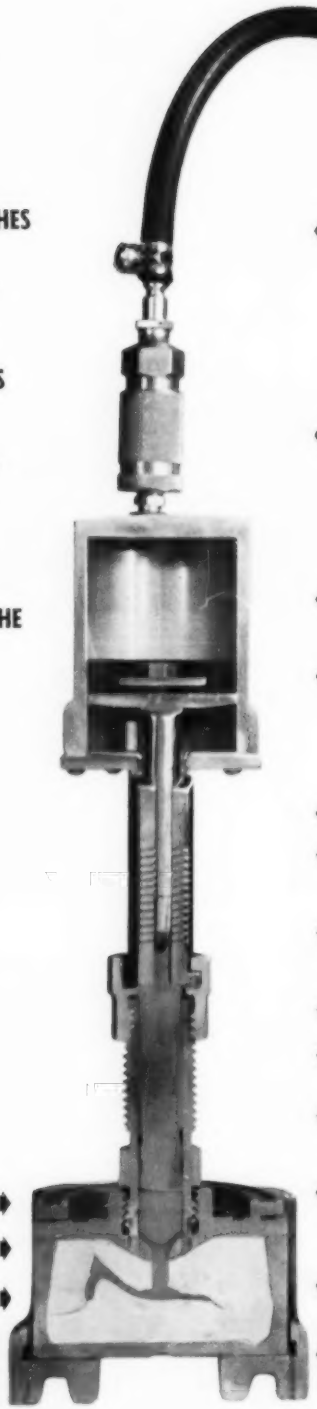
THE USE OF THE FAMOUS

PRESSURE CAST PROCESS.

THIS CASTING PROCESS

VIRTUALLY ELIMINATES THE

RAISED BITE ERROR.



Hose to compressed air supply.

Air gun coupler permits an easy connection to air supply.

Air gun cylinder.

Air gun cup.

Air gun piston.

Air gun guide indicates amount inject

Hole in piston enables operator to rem the piston by slipping metal rod thro the hole and pulling it up. This is ne sary for recharging.

Air gun adapter.

Piston.

Nozzle threaded to screw into air g adapter.

Sprue button.

In the center of the flask is a cross-sect of the moulded denture having no

Bottom ring of the "cage" which, wh tightened in cage closer, closes the fl perfectly.

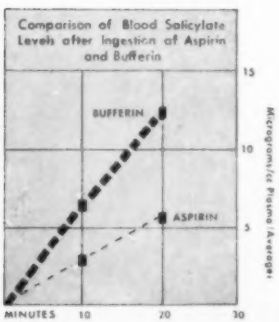
Lid and bottom surface perfectly flat so as to close uniformly.

Side of cage.

Flask splits here. Notice how perfectly closed — metal to metal contact.

Printed in U.S
44-55 D

GIVE YOUR PATIENT FASTER PAIN RELIEF with BUFFERIN®



Relieve the pain attending dental treatment—whether extraction or cavity preparation—by recommending BUFFERIN. This antacid analgesic acts twice as fast as aspirin. In ten minutes after taking BUFFERIN the blood salicylate levels are higher than those attained with aspirin in twice the time.

Gastric distress is almost unknown when BUFFERIN is taken, even in large doses, for BUFFERIN is antacid.

Your patients will appreciate BUFFERIN's prompt antacid analgesic action.

BUFFERIN contains no sodium.

BUFFERIN®

Acts Twice as Fast as Aspirin

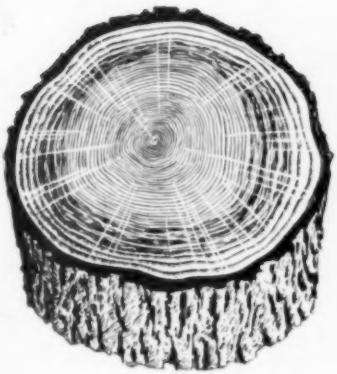
Does Not Upset the Stomach

Accepted COUNCIL on DENTAL THERAPEUTICS AMERICAN DENTAL ASSOCIATION

EACH BUFFERIN TABLET contains 5 grains of acetylsalicylic acid, together with optimum amounts of the antacids aluminum glycinate and magnesium carbonate.

BRISTOL-MYERS CO., 19 W. 50 St., New York 20, New York

STRENGTH FROM STRUCTURE



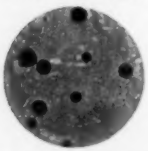
Who hasn't seen *strength* in the *structure* of a tree? Just cut across a mighty trunk to find the secret—one year's growth bonded to another in a slow natural process that welds, compresses and laminates at the same time . . .

Nature develops the strength of natural teeth in much the same way by building a dense, homogenous internal structure. A similar internal structure is necessary to achieve greater strength in artificial porcelain teeth.

Only the vacuum fired porcelain of Trubyte Bioform Teeth has a dense, homogenous structure comparable to that of natural teeth. This exclusive Trubyte Bioform process creates not only *stronger* teeth, but more *natural*, *vital* and *lifelike teeth*.

The greater strength and beautiful esthetics of Trubyte Bioform Vacuum Fired Porcelain offers a *new* opportunity for increased success in modern professional denture service.

CONVENTIONAL AIR FIRED PORCELAIN



TRUBYTE BIOFORM VACUUM FIRED PORCELAIN

Note in these two micro-photographs how the denser, more homogenous structure of vacuum fired porcelain is substantially free from the voids and bubbles found in conventional porcelain.

trubyte Bioform® teeth

the first "vacuum fired porcelain" teeth

THE DENTISTS' SUPPLY COMPANY OF N. Y.

YORK, PENNSYLVANIA